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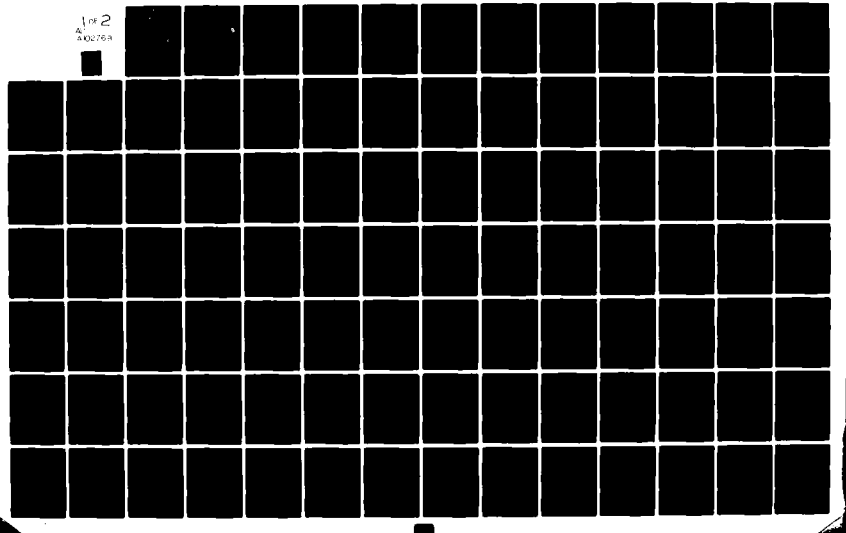

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SAN FRANCISCO BAY AREA CARGO FORECAST

Prepared For

ARMY CORPS OF ENGINEERS

By

RECHT HAUSRATH & ASSOCIATES
and
TEMPLE, BARKER & SLOANE INC.

JUNE 1981

SAN FRANCISCO BAY AREA CARGO FORECAST.

Prepared For:

ARMY CORPS OF ENGINEERS
SAN FRANCISCO DISTRICT

Prepared By:

RECHT HAUSRATH & ASSOCIATES
155 BOVET ROAD
SAN MATEO, CALIFORNIA 94402

TEMPLE, BARKER & SLOANE, INC.
33 HAYDEN AVENUE
LEXINGTON, MASSACHUSETTS 02173

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I. INTRODUCTION AND FORECAST SUMMARY

This report presents the San Francisco Bay Area Cargo Forecast developed by Recht Hausrath & Associates (RHA) and Temple, Barker & Sloane, Inc. (TBS). The forecast was prepared under contract to the Army Corps of Engineers and in cooperation with the Technical Advisory Committee (TAC), created to assist in forecast development. Members of the TAC included representatives of the Army Corps of Engineers (Corps), the Metropolitan Transportation Commission (MTC), the Bay Conservation and Development Commission (BCDC), the U.S. Maritime Administration (MarAd), and the Northern California Ports and Terminals Bureau (NORCAL).

On March 18, 1981, the Seaport Planning Advisory Committee* officially approved the forecast for use in the Seaport Plan for the nine Bay Area counties. It has been adopted for use by those engaged in the planning and development of port facilities in the San Francisco Bay Area. This forecast replaces the dry cargo projections done by the Army Corps in 1976 and the dry cargo forecasts adopted in 1977 during Phase I of the MTC/BCDC Regional Port Planning Project.

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*This committee consists of representatives from MTC, BCDC, Corps, MarAd, the Association of Bay Area Governments (ABAG), the Bay Area Council, the Save San Francisco Bay Association, and the six Bay Area ports.

This chapter first summarizes the forecasting approach, provides background on recent levels of trade, and presents the baseline, high, and low forecasts for 1985, 1990, 2000 and 2020. The major assumptions and scenarios of future events supporting the forecasts are then summarized for the major cargo groups comprising the Bay Area dry cargo trade. A more complete description of the basis for the forecasts and a review of recent trade for each cargo sector studied is provided in Chapters II through XII.

APPROACH

In general, the approach to forecasting is based on the concept of identifying discrete, readily understood cargo groups and compiling comprehensive data on the trends and factors affecting each group. As appropriate for each of the cargo flows, three levels of detail have been reviewed. First, the levels of trade and rates of growth of cargo within the Bay Area have been compiled to provide a foundation for expected future trade and a background for the analysis of factors affecting that trade. Second, the overall levels of trade among the major ports on the Pacific Coast have been reviewed to identify competitive trends that may shift cargo among the ports. Finally, trends on the Pacific Coast and in the United States, as a whole, have been reviewed to identify their effects on the cargo groups.

CARGO SECTORS

The eleven cargo sectors selected for the forecast, shown in Table 1, define both a particular segment of the shipping market and a mode of shipment. In particular, grains, iron and steel scrap, coke, sugar, salt and other bulk are all handled as dry bulk cargos. Newsprint, iron and steel, and automobiles generally travel in specialized carriers and

Table 1

SAN FRANCISCO BAY AREA CARGO FORECAST

CARGO SECTOR DEFINITIONS[A]

Group	Source
Containerized Cargo	Foreign imports and exports - Maritime Administration MA578A data, adjusted by TBS (per Appendix B)
	Domestic shipments and receipts - Corps dry cargo for Oakland and San Francisco, net of other cargo sectors
Breakbulk Cargo	Foreign imports and exports - Corps dry cargo net of other cargo groups
	Domestic shipments and receipts - Corps dry cargo for Redwood City, Richmond, San Pablo Bay and Carquinez, net of other cargo sectors
Neobulk Cargo	
Automobiles	Commodity 3711
Iron and Steel Products	Commodities 3314, 3315, 3316, 3317, 3318 and 3319
Newsprint	Commodity 2621
Dry Bulk Cargo	
Grains	Commodities 0102, 0103, 0104, 0105, 0106, 0107 and 0111
Iron and Steel Scrap	Commodity 4011
Coke	Commodities 2920 and 3313
Sugar	Commodity 2061
Salt	Commodity 1491
Other Bulk	Commodities 3241, 1442, 1411, 1121

[A] As reported in Waterborne Commerce of the United States, Part 4 - Army Corps of Engineers, but excluding liquid cargos. 4-digit commodity codes are from the Commodity Classification for Domestic Waterborne Commerce, compiled by the Army Corps. (See Appendix A.)

comprise the neobulk cargos. Container and breakbulk define the two major segments of general cargo. The cargo sectors do not include liquid cargos since they were excluded from the scope of this forecasting effort. Military cargos are also excluded from this effort except for peacetime levels of containerized military cargo carried in commercial vessels. Appendix A of the report provides additional discussion about the definitions of the cargo sectors.

The cargo groups are particularly useful for facilities planning within the Bay Area. Each of the dry bulk cargos is generally associated with a particular type of facility. The neobulk cargos each have unique requirements beyond those generally required for bulk or general cargo, while the break-bulk and container groups distinguish the differing requirements for general cargo.

An additional division of the above cargo sectors is cargo that would be carried by high technology ships such as Ro/Ro vessels and barge carriers. In recent years, these vessel designs have been introduced in an attempt to meet specialized needs not fully met by other vessel types. Previous forecasts of the Bay Area have included the cargo these vessels would carry in a Container/LASH/Ro-Ro category. This forecast includes these cargos in several separate trade categories, as described in Appendix A. In terms of tonnages, most of the non-automobile Ro/Ro cargo is in the container cargo group. Automobiles and other motor vehicles are identified separately as the auto cargo sector. LASH cargos are included as containers, breakbulk, scrap, or grain, and cannot be easily identified. The difficulty in separately identifying LASH shares of these cargos is not a major problem for facility planning since LASH operations in the Bay Area have declined to low levels and are not expected to increase.

INFORMATION BASE

The cargo sector definitions in Table 1 describe the source of the data used to define each sector as well as the source for identifying historic and 1978 base year tonnages. Except as noted for containerized cargo, much of the historical analysis was based on cargo tonnages compiled from the Army Corps of Engineers publication Waterborne Commerce of the United States, Part 4. Bay Area cargo was defined to include cargo at San Francisco, Oakland/Alameda, Redwood City, Richmond, San Pablo Bay, and Carquinez Straits as compiled by the Corps. Other government data sources (various Maritime Administration and Bureau of Census reports) were used to provide detail on origin, destination, and type of carriage. Additional information on the factors affecting the trade was compiled from a variety of sources including industry publications, government studies, trade associations, and interviews with industry representatives.

Container Cargo Statistics

Though many of the cargo categories are easily defined and analyzed as a single commodity or group of commodities, the containerized cargo sector includes a wide variety of commodities. Previous forecasts for the Bay Area have used estimates of container traffic or measures of "containerizable" cargo for the historical base, since containerized traffic statistics were not readily available. However, this forecast was able to incorporate two types of container cargo data:

- Containerized cargo tonnages as compiled since 1973 to identify recent and 1978 base year containerized cargo, and
- Containerizable cargo statistics to analyze long term growth patterns in developing the forecasts.

Containerized Cargo

The tonnages for containerized general cargo were drawn from data tapes of the MA578A container cargo reports compiled by MarAd and published annually as Containerized Cargo Statistics. TBS reviewed and adjusted the container cargo data to insure consistency with three other sources.*

- National Trade/Vessel Analysis reports, compiled by TBS for the Maritime Administration from daily vessel call data, showing import and export tonnage carried by breakbulk, partial and full containerships;
- Census 305/705 reports and FT985 reports of U.S. - foreign liner tonnage by trade route and direction; and
- Pacific Maritime Association (PMA) revenue tonnage reports** for container and general cargo at the individual Pacific Coast ports.

Briefly, the containerized cargo data for the Bay Area was adjusted upward (by 300,000 tons from 925,423 to 1,225,423) for 1978 imports and downward (by 400,000 tons from 2,553,489 to 2,153,489) for 1977 exports. The adjustments brought the Maritime Administration containerized cargo data into alignment with liner cargo on Trade Route 29 and into alignment with cargo carried on containerships calling San Francisco and Oakland.

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*For additional discussion, see Appendix B of this report. The actual adjustments are noted in the tables and text of the report.

**Revenue tonnage is either short tons (weight) or measurement tons (volume), depending on the tariff schedule for the individual commodities moved and in aggregate displays an identifiable relationship with short tons over time, as identified in Appendix C.

The adjusted container tonnages were also compared with PMA revenue tonnage data since PMA container revenue tons for the Bay Area had shown considerable growth (at a compound annual rate of 12.3 percent for 1971 to 1979 and 9.0 percent for 1973 to 1978) while the weight tonnage had grown more slowly (at a compound annual rate of 2.4 percent for 1973 to 1978). The differences in growth rates were identified as due to:

- Changes in the mix of imports, exports, and domestic trade, each with a different relationship between revenue tons and short tons because of different tariff schedules and types of cargos; and
- Changes in the ratios of revenue tons to short tons independent of the changing balance of import, export, and domestic trade because of changing commodity mixes and packaging forms and changes in the rating of cargo for tariff purposes.

Accounting for changes in these factors identified the relationship between revenue tons and short tons over time and explained that the higher rate of growth of PMA container revenue tonnage is compatible with the more moderate growth of weight tons.

In combination, the above comparisons and adjustments insure that the containerized cargo tonnages compiled for the Pacific Coast and Bay Area accurately reflect recent and 1978 base year levels of container trade.

Containerizable Cargo

Containerizable, as distinct from containerized, cargo is defined to include all commodities which, by current standards, are physically and economically suitable for containerization. The containerizable data base was developed for analyzing the growth of containerizable cargo over the past 20 years. This data is useful in forecasting since it distinguishes the long term growth of trade independent of the historic shift of break-bulk to container.

The containerizable cargo statistics were developed from a series of analyses done for hearings before the Maritime Subsidy Board (MSB). The time series date back to 1959 and were compiled from data at the Census 3- and 4-digit commodity level to include the share of each cargo that would typically move by container. The containerizable statistics are derived from MarAd 001 and 002 reports which are MarAd compilations of original Census foreign trade data, the same Census data base used for the Army Corps foreign trade cargo statistics.*

RECENT TRADE

Pacific Coast

The Pacific Coast trade, shown in Table 2, experienced steady growth between 1965 and 1973. Trade then remained nearly constant between 1974 and 1977, but has shown sizable growth in 1978 and 1979. Comparison of the growth of Pacific Coast and total U.S. trade demonstrates that the Pacific Coast has out-paced the U.S. in general. Pacific Coast foreign dry cargo trade, in particular, has grown more rapidly than total U.S. trade. Domestic dry cargo trade on the Pacific Coast has been

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*For additional discussion of the containerizable cargo statistics, see Appendix B of this report.

Table 2

PACIFIC COAST FOREIGN (LINER & IRREGULAR)
AND DOMESTIC DRY CARGO TRADE

1965-1979

(short tons)

Year	Foreign		Pacific Coast % of U.S. Foreign	Foreign % of Total Pacific Coast	Domestic		Pacific Coast % of U.S. Domestic	Domestic % of Total Pacific Coast	Total		Pacific % of U.S.
	Total U.S.	Pacific Coast			Total U.S.	Pacific Coast			U.S.	Pacific	
1965	273,330,400	32,897,760	12.0%	73.4%	44,381,148	11,927,671	26.9%	26.6%	317,711,548	44,825,431	14.1%
1966	298,071,200	38,507,840	12.9	78.8	41,268,483	10,368,389	25.1	21.2	339,339,683	48,876,229	14.4
1967	294,347,200	44,011,520	15.0	80.6	42,358,273	10,578,833	25.0	19.4	336,705,473	54,590,353	16.2
1968	315,977,760	49,637,280	15.7	83.9	39,415,379	9,513,410	24.1	16.1	355,393,139	59,150,690	16.6
1969	314,648,320	53,874,240	17.1	85.7	36,301,372	9,011,570	24.8	14.3	350,949,692	62,885,810	17.9
1970	353,442,880	58,953,440	16.7	86.6	34,812,399	9,091,688	26.1	13.4	388,255,279	68,045,128	17.5
1971	325,969,280	49,517,440	15.2	84.3	34,917,642	9,223,423	26.4	15.7	360,886,922	58,740,863	16.3
1972	351,425,760	58,315,600	16.6	85.2	39,116,526	10,154,877	26.0	14.8	390,542,286	68,470,477	17.5
1973	401,832,480	69,755,840	17.4	85.3	41,237,177	11,984,029	29.1	14.7	443,069,657	81,739,869	18.4
1974	400,807,680	68,680,640	17.1	85.3	40,334,084	11,812,330	29.3	14.7	441,141,764	80,492,970	18.2
1975	386,573,600	62,560,960	16.2	85.9	36,221,525	10,239,708	28.3	14.1	422,795,125	72,800,658	17.2
1976	405,084,960	71,336,160	17.6	87.9	33,546,510	9,833,269	29.3	12.2	438,631,470	81,169,429	18.5
1977	405,882,400	71,243,240	17.6	87.8	34,423,168	9,932,547	28.9	12.2	440,305,568	81,166,787	18.4
1978	439,998,800	81,275,300	18.5	89.6	36,559,892[A]	9,438,019[A]	25.8	10.4	476,558,692	90,713,319	19.0
1979	481,979,350	91,022,350	18.9	90.6	36,559,892[B]	9,438,019[B]	25.8	9.4	518,539,242	100,460,369	19.4

[A] Based on preliminary data and therefore subject to revision.
[B] For purposes of analysis, the 1978 domestic tonnages were assumed for 1979.

Source: U.S. Waterborne Exports and General Imports Annual, 1965-1979,
U.S. Bureau of the Census, excluding military cargo.
Domestic Waterborne Commerce of the United States 1965-1978,
U.S. Maritime Administration.
Domestic data includes cargo in self-propelled and non-self-propelled
dry cargo vessels and excludes all Great Lakes and inland waterways cargo.

a fairly constant share of all U.S. domestic trade and, like the U.S. domestic trade in total, has declined over the 1965 to 1979 period. As a result, the foreign trade share of Pacific Coast trade has increased from 73.4 percent in 1965 to 90.6 percent in 1979.

Bay Area

Total trade within the Bay Area, shown in Table 3, has been stable over the 1969 to 1978 period. Total dry cargo tons in 1969 were 8,567,621 and in 1978 were 9,436,334, for a compound annual rate of growth of 1.1 percent. Tables 4 and 5 detail all Bay Area dry cargo trade, both foreign and domestic, by the cargo sectors used in the forecast. From these tables, it is apparent that there has been considerable change in the relative importance of the cargo groups over time.

Table 3

SAN FRANCISCO BAY AREA DRY CARGO
(short tons)

YEAR	IMPORTS	EXPORTS	RECEIPTS	SHIPMENTS	TOTAL
1969	2,438,055	3,280,448	1,416,925	1,432,193	8,567,621
1970	2,349,406	2,922,516	1,255,091	1,772,288	8,299,301
1971	2,164,911	2,636,342	1,336,603	1,140,241	7,278,097
1972	2,783,259	2,854,390	1,656,868	1,208,928	8,503,445
1973	2,469,226	3,897,756	1,895,847	1,623,424	9,886,253
1974	2,734,111	3,869,020	1,683,077	1,471,460	9,757,668
1975	2,204,837	3,233,669	1,285,260	1,315,381	8,039,147
1976	2,384,679	3,497,088	1,451,833	1,285,368	8,618,968
1977	2,737,090	3,576,304	1,185,119	1,143,734	8,642,247
1978	3,009,332	4,217,346	1,230,829	978,827	9,436,334

Source: Tables 4 and 5.

Table 4

SAN FRANCISCO BAY AREA[A] FOREIGN TRADE
HISTORICAL TONNAGE BY CARGO SECTOR
(short tons)

	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978
Foreign Imports										
TOTAL DRY CARGO	2,438,055	2,349,406	2,164,911	2,783,259	2,469,226	2,734,111	2,204,837	2,384,679	2,737,090	3,009,332
General Cargo	1,346,746	1,232,578	1,118,542	1,262,889	1,343,569	1,306,673	1,075,509	1,229,650	1,544,381	1,577,894
Container	--	--	--	--	556,443	773,274	710,914	941,784	1,260,940	1,225,423
Breakbulk	--	--	--	--	787,126	533,399	364,595	287,866	283,441	352,471
Automobiles	108,419	125,299	152,757	151,035	158,773	172,788	143,802	191,147	234,359	278,239
Iron and Steel	440,121	427,512	462,658	628,923	512,666	681,475	534,192	489,860	557,121	714,323
Newsprint	214,004	210,883	149,799	187,476	237,949	239,595	180,959	253,618	211,158	250,000[C]
Grains	440	2,279	85	60	35	5	177	199	249	78
Iron and Steel Scrap	145	3	0	829	25	22	0	1	2	116
Petroleum Coke	43,782	101	175,479	118,434	10	18,422	50,671	29,828	64,091	24,158
Sugar	75,632	108,758	22,351	173,231	28,812	116,349	13,892	42,846	25,107	20,285
Salt	9	6	36	2	30	0	9	2	3	116
Other Bulk	208,757	241,987	83,206	260,380	187,357	198,782	205,626	147,528	100,619	144,123
Foreign Exports										
TOTAL DRY CARGO[B]	3,280,448	2,922,516	2,636,342	2,854,390	3,897,756	3,869,020	3,233,669	3,497,088	3,576,304	4,217,346
General Cargo	1,665,031	1,569,562	1,261,802	1,458,424	2,003,433	2,212,683	1,816,642	2,205,084	2,351,346	2,790,945
Container[2]	--	--	--	--	1,597,253	1,791,906	1,694,413	1,956,925	2,153,489	2,657,686
Breakbulk	--	--	--	--	406,180	420,777	122,229	248,159	197,857	133,259
Automobiles	49,757	44,579	27,450	24,597	39,816	71,872	52,747	40,061	40,338	62,140
Iron and Steel	97,913	108,513	94,526	55,900	76,800	123,537	165,219	93,088	60,945	68,739
Newsprint	159	407	237	2	20	424	357	466	1,882	5,534
Grains	22,440	44,714	22,093	68,532	298,782	242,099	362,565	183,592	199,984	275,564
Iron and Steel Scrap	751,125	726,503	556,305	504,526	791,015	592,048	403,547	409,773	443,080	564,134
Petroleum Coke	251,596	229,916	268,913	319,731	532,774	520,568	329,557	411,063	352,313	282,931
Sugar	277	263	961	191	504	1,143	2,962	629	431	245
Salt	441,340	196,426	400,231	422,214	151,682	104,167	99,802	152,980	119,609	164,312
Other Bulk	810	1,533	3,824	273	2,930	479	271	352	6,375	2,862

[A] San Francisco, Oakland/Alameda, Redwood City, Richmond, San Pablo Bay and Carquinez Straits
[B] Includes an estimated quantity of 300,000 tons of military cargo per year.
[C] Reduced from 345,263 to correct a probable error in Census data.

Source: Waterborne Commerce of the United States, Part 4.
U.S. Army Corps of Engineers, 1969-1978.
Foreign Container tonnage from Supplemental Unitized Cargo
Container Reports, Maritime Administration, See also Table 1.

Table 5

SAN FRANCISCO BAY AREA[A] DOMESTIC TRADE
HISTORICAL TONNAGE BY CARGO SECTOR
(short tons)

	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978
Domestic Receipts										
TOTAL DRY CARGO	1,416,925	1,255,091	1,336,603	1,656,868	1,895,847	1,683,077	1,285,260	1,451,833	1,185,119	1,230,829
General Cargo	497,711	408,201	458,377	643,362	897,896	795,774	500,163	484,239	433,805	367,870
Container	--	--	--	--	853,797	750,548	479,595	484,239	433,805	367,870
Breakbulk	--	--	--	--	44,099	45,226	20,568	0	0	0
Automobiles	4,518	11,586	8,900	10,587	7,319	10,619	10,637	8,619	9,084	8,508
Iron and Steel	203,904	187,367	151,880	165,906	220,045	114,161	24,108	5,157	2,046	212
Newsprint	2	0	0	0	0	94	0	0	0	0
Grains	0	0	23	22,369	296	66,824	152	66,452	22,470	64
Iron and Steel Scrap	933	1,058	976	1,276	5,748	10,114	9,499	8,894	6,892	6,753
Petroleum Coke	0	0	0	0	0	0	0	0	0	0
Sugar	709,707	645,638	632,263	763,346	753,090	677,458	737,838	878,014	710,430	827,573
Salt	92	0	0	30	0	42	115	157	0	0
Other Bulk	58	1,241	84,184	49,992	6,453	7,991	2,748	301	392	19,849
Domestic Shipments										
TOTAL DRY CARGO	1,432,193	1,772,288	1,140,241	1,208,928	1,623,424	1,471,460	1,315,381	1,285,368	1,143,734	978,827
General Cargo	726,721	987,772	937,442	1,055,667	1,460,412	1,304,893	1,115,894	1,060,563	918,602	758,363
Container	--	--	--	--	1,450,403	1,304,893	1,115,894	1,060,563	918,602	758,363
Breakbulk	--	--	--	--	10,009	0	0	0	0	0
Automobiles	30,222	33,040	27,547	35,840	44,607	35,136	48,717	50,180	59,927	55,171
Iron and Steel	44,325	34,797	26,478	33,849	47,830	44,435	40,460	34,144	34,033	34,148
Newsprint	494	221	497	540	381	285	0	0	0	3
Grains	48,447	58,764	53,102	42,480	52,013	48,058	56,477	66,077	63,749	94,590
Iron and Steel Scrap	0	0	47	301	57	61	0	20	8,741	0
Petroleum Coke	0	0	0	0	0	0	0	0	0	12
Sugar	1,785	1,918	2,039	5,178	2,607	2,671	2,312	2,900	2,047	1,860
Salt	149,517	183,405	92,325	3,243	13,848	5,370	4,653	5,502	4,704	5,020
Other Bulk	430,682	472,371	764	31,830	1,669	30,551	46,868	65,982	51,931	29,660

[A] San Francisco, Oakland/Alameda, Redwood City, Richmond, San Pablo Bay and Carquinez Straits

Source: Waterborne Commerce of the United States, Part 4.
U.S. Army Corps of Engineers, 1969-1978; See also Table 1.

Growth in foreign trade has been lead by the containerized cargo group. Iron and steel imports and automobile imports have also shown steady increases in tonnage. Grain exports dramatically increased in 1973 while salt exports declined sharply in the same year. Domestic cargo has declined overall with much of the fall-off occurring in domestic shipments. Iron and steel domestic receipts have nearly disappeared, as have domestic shipments of salt. Overall, foreign trade increased from 66.7 percent of total Bay Area trade in 1969 to 76.6 percent in 1978.

As shown in Table 6, container cargos now represent the majority of Bay Area dry cargo trade, having increased the most in relative importance among the major cargo groups.

Table 6

SAN FRANCISCO BAY AREA

DISTRIBUTION OF MAJOR DRY CARGO GROUPS

	-----Percentage Shares of Total Cargo[A]----		
	1978	1973	1969
General Cargo	58.2%	57.7%	49.4%
Container	53.1	45.1	--
Breakbulk	5.2	12.6	--
Neobulk	15.6	13.6	13.9
Dry Bulk	26.1	28.7	36.6

[A] Percentages do not add to 100 due to rounding

CARGO FORECASTS

Overview

The Bay Area cargo forecast is summarized by major cargo group in Table 7. Three scenarios are presented for each cargo group: the baseline forecast, followed by a high and low

Table 7

SAN FRANCISCO BAY AREA
FORECAST SUMMARY
(thousands of short tons)

	1978	Forecast 1985	1990	2000	2020
Container	5,009	8,260	12,065	19,610	49,020
High		8,960	13,720	23,510	60,030
Low		7,351	9,876	15,146	37,036
Breakbulk	486	465	440	425	320
High		480	450	445	420
Low		395	330	320	310
Neobulk	1,476	1,679	1,964	2,304	3,209
High		1,789	2,219	2,574	3,524
Low		1,574	1,679	1,809	2,109
Dry Bulk	2,465	2,735	2,845	3,110	3,930
High		3,435	8,680	9,035	10,080
Low		2,350	2,430	2,630	3,260
Total[A]	9,436	13,139	17,314	25,449	56,479
High		14,579	24,949	35,439	73,944
Low		11,755	14,435	20,030	42,025

[A] Since the level of container trade depends partly on the shift of breakbulk to container, the high container forecast was combined with the low breakbulk forecast and the low container forecast with the high breakbulk, to calculate the total of the forecasts.

Source: Table 8.

variation. The baseline forecasts for 1985 and 1990 are the most likely estimates. One can place the greatest confidence in the 1985 and 1990 baseline forecasts while the high and low variations represent possible alternative levels of trade. As the forecasts extend into the future, the range between the high and low levels increases.

As in the past, container cargos are projected to dominate the Bay Area trades. By 1990, high growth of container cargos is projected to increase the container trade share of total Bay Area dry cargo to 70 percent of the baseline forecast. Continued growth is projected to raise that share thereafter. Breakbulk cargo is projected to decline slowly, partly because of the growth in containerization on developing trade routes. Neobulk and dry bulk cargos are forecast to grow at moderate rates.

Forecasts for the individual cargo sectors in each major category are presented in Table 8 and Table 9 summarizes the growth rates reflected by each forecast. A summary for each cargo sector is provided below, highlighting the basis for the forecast and for the differences between the baseline, high, and low scenarios.

Containerized Cargo

Significant growth is forecast for Bay Area containerized cargo (see Figure 1). For the baseline forecast, a 140 percent increase in tonnages is forecast by 1990, with growth from 5.0 million short tons in 1978 to 12.1 million short tons in 1990. Continued growth of container trade is forecast to reach 19.6 million short tons by 2000.

Table 8

SAN FRANCISCO BAY AREA CARGO FORECAST
FORECAST SCENARIOS

	1978	Forecast			
		1985	1990	2000	2020
Baseline Forecast					
Container	5,009	8,260	12,065	19,610	49,020
Foreign Container	3,883	7,010	10,720	18,085	47,065
Domestic Container	1,126	1,250	1,345	1,525	1,955
Breakbulk	486	465	440	425	320
Foreign Breakbulk	486	465	440	425	320
Domestic Breakbulk	---	---	---	---	---
Neobulk	1,476	1,679	1,964	2,304	3,209
Autos - Imports	278	365	445	540	800
- Other	126	126	126	126	126
Iron & Steel - Imports	714	820	1,010	1,225	1,805
- Other	103	103	103	103	103
Newsprint - Imports	250	260	275	305	370
- Other	5	5	5	5	5
Dry Bulk	2,465	2,735	2,845	3,110	3,930
Grain - Exports	276	595	690	930	1,680
- Other	95	105	120	145	215
Iron & Steel Scrap	564	450	450	450	450
Coke	283	300	300	300	300
Sugar	828	830	830	830	830
Salt	164	200	200	200	200
Other Bulk[A]	255	255	255	255	255
High Scenario Forecast					
Container	5,009	8,960	13,720	23,510	60,030
Foreign Container	3,883	7,575	12,115	21,455	56,660
Domestic Container	1,126	1,385	1,605	2,055	3,370
Breakbulk	486	480	450	445	420
Foreign Breakbulk	486	480	450	445	420
Domestic Breakbulk	---	---	---	---	---
Neobulk	1,476	1,789	2,219	2,574	3,524
Autos - Imports	278	390	500	610	905
- Other	126	126	126	126	126
Iron & Steel - Imports	714	890	1,180	1,395	1,975
- Other	103	103	103	103	103
Newsprint - Imports	250	275	305	335	410
- Other	5	5	5	5	5
Dry Bulk	2,465	3,435	8,680	9,035	10,080
Grain - Exports	276	665	890	1,200	2,100
- Other	95	115	135	180	325
Iron & Steel Scrap	564	600	600	600	600
Coke	283	350	350	350	350
Sugar	828	950	950	950	950
Salt	164	300	300	300	300
Other Bulk[A]	255	455	5,455	5,455	5,455
Low Scenario Forecast					
Container	5,009	7,351	9,876	15,146	37,036
Foreign Container	3,883	6,225	8,750	14,020	35,910
Domestic Container	1,126	1,126	1,126	1,126	1,126
Breakbulk	486	395	330	320	310
Foreign Breakbulk	486	395	330	320	310
Domestic Breakbulk	---	---	---	---	---
Neobulk	1,476	1,574	1,679	1,809	2,109
Autos - Imports	278	320	335	370	450
- Other	126	126	126	126	126
Iron & Steel - Imports	714	770	860	955	1,175
- Other	103	103	103	103	103
Newsprint - Imports	250	250	250	250	250
- Other	5	5	5	5	5
Dry Bulk	2,465	2,350	2,430	2,620	3,260
Grain - Exports	276	500	580	780	1,410
- Other	95	95	95	95	95
Iron & Steel - Scrap	564	400	400	400	400
Coke	283	250	250	250	250
Sugar	828	700	700	700	700
Salt	164	150	150	150	150
Other Bulk[A]	255	255	255	255	255

[A] Includes limestone, cement, coal, and miscellaneous tonnages of scrap, coke, sugar, and salt.

Table 9

SAN FRANCISCO BAY AREA CARGO FORECAST

CARGO SECTOR GROWTH RATES

		1978	1978-1985	1985-1990	1990-2000	2000-2020
Containerized General Cargo:						
Foreign-Trade Route 29	Baseline	3,106	9.5%	9.5%	5.5%	5.0%
	High		10.5	10.5	6.0	5.0
	Low		7.5	7.5	5.0	5.0
Foreign-Other Routes	Baseline	777	3.6%	3.6%	3.6%	3.6%
	High		4.5	4.5	4.5	4.5
	Low		3.0	3.0	3.0	3.0
			Shift To Container	Shift To Container	Shift To Container	Shift To Container
Foreign Breakbulk that Containerizes (All Trade Routes)	Baseline	486[A]	3.6% 25%	3.6% 40%	3.6% 60%	3.6% 85%
	High		4.5 40	4.5 60	4.5 75	4.5 90
	Low		3.0 20	3.0 35	3.0 50	3.0 75
Domestic Container	Baseline	1,126	1.5%	1.5%	1.25%	1.25%
	High		3.0	3.0	2.5	2.5
	Low		0.0	0.0	0.0	0.0
			Remaining Breakbulk	Remaining Breakbulk	Remaining Breakbulk	Remaining Breakbulk
Breakbulk	Baseline	486[A]	3.6% 75%	3.6% 60%	3.6% 40%	3.6% 15%
	High		3.0 80	3.0 65	3.0 50	3.0 25
	Low		4.5 60	4.5 40	4.5 25	4.5 10
Neobulk						
Automobiles - Imports	Baseline	278	4.0%	4.0%	2.0%	2.0%
	High		5.0	5.0	2.0	2.0
	Low		2.0	1.0	1.0	1.0
- Other	Baseline, High & Low	126	0.0	0.0	0.0	0.0
Iron & Steel - Imports	Baseline	720[B]	4.4%	4.3%	1.9%	2.0%
	High		7.3	5.8	1.7	1.8
	Low		2.3	2.2	1.1	1.0
- Other	Baseline, High & Low	103	0.0	0.0	0.0	0.0
Newsprint - Imports	Baseline	250[C]	1.0%	1.0%	1.0%	1.0%
	High		2.0	2.0	1.0	1.0
	Low		0.0	0.0	0.0	0.0
- Other	Baseline, High & Low	5	0.0%	0.0%	0.0%	0.0%
Drybulk						
Grains - Exports	Baseline	420[D]	6.0%	3.0%	3.0%	3.0%
	High		8.0	6.0	3.0	3.0
	Low		3.0	3.0	3.0	3.0
Grains - Domestic	Baseline	95	2.0%	2.0%	2.0%	2.0%
	High		3.0	3.0	3.0	3.0
	Low		0.0	0.0	0.0	0.0
Iron & Steel Scrap	Baseline, High & Low	564	Forecast at baseline, high, and low levels to reflect recent variations in tonnages.			
Petroleum Coke	Baseline, High & Low	283				
Sugar	Baseline, High & Low	828				
Salt	Baseline, High & Low	164				
Other Bulk Cargo	Baseline, High & Low	255	Forecast at base levels, with limestone imports and coal exports included in high.			

[A] Breakbulk tonnage is duplicated under container and breakbulk for clarity.

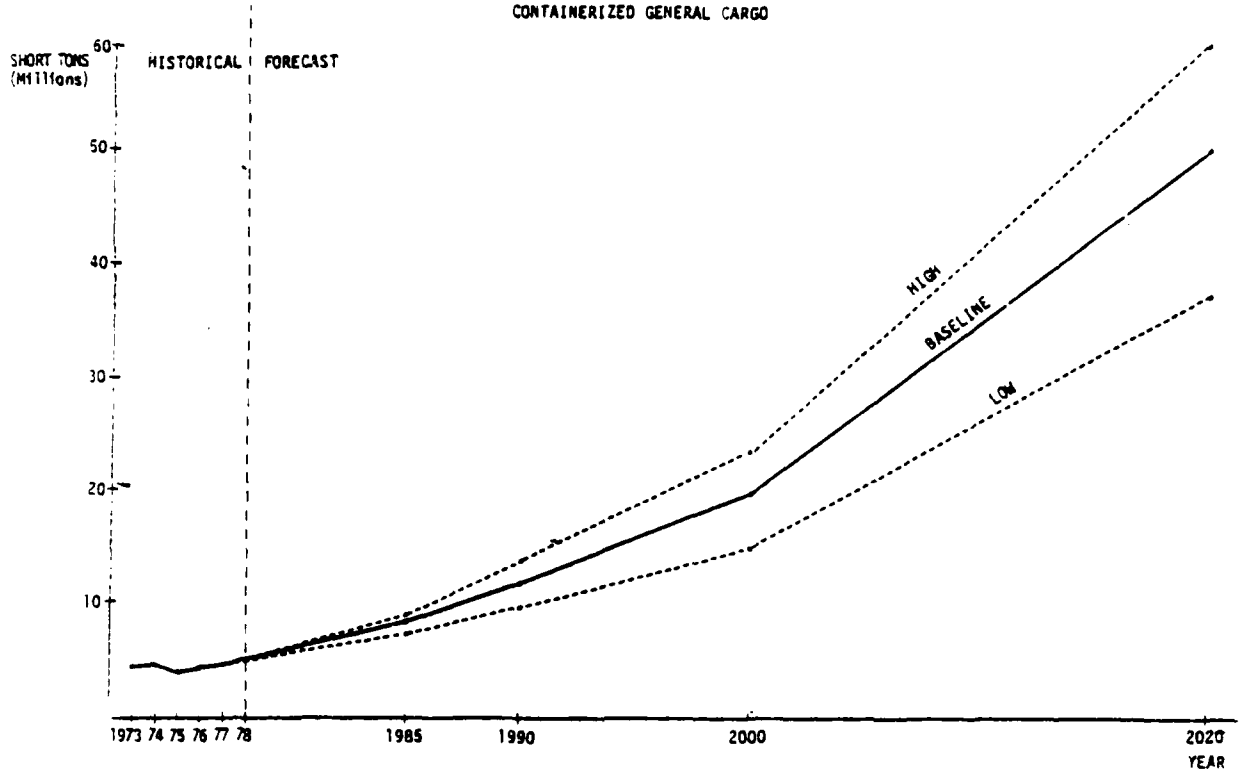
[B] The 1985 forecast is based on three years of growth, from 1982 to 1985, at the rates shown; tonnages recover to this 1979 level by 19

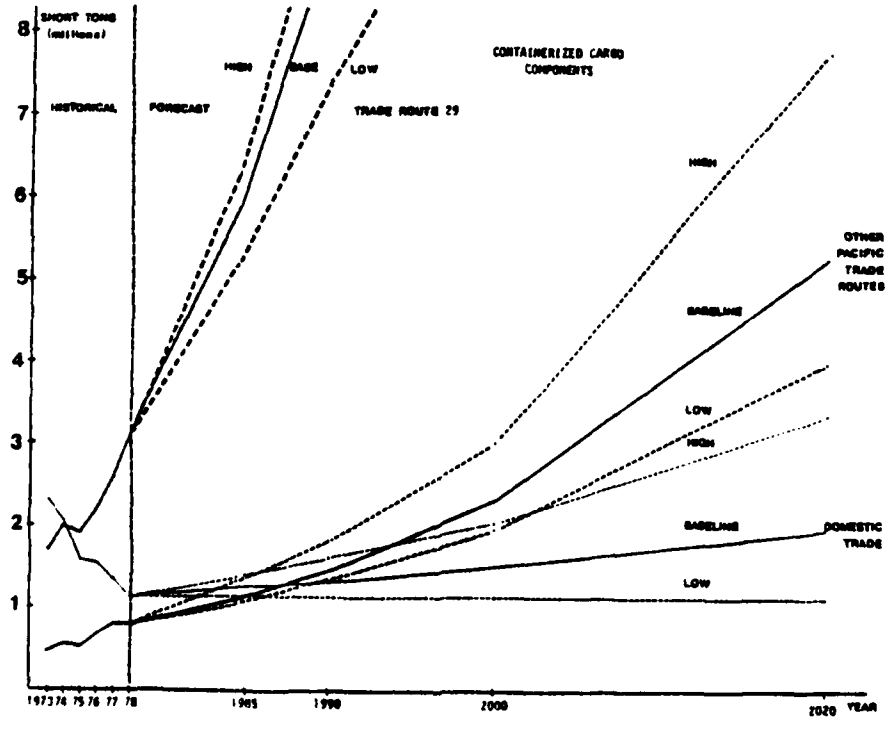
[C] The 1985 forecast is based on five years of growth at the rates shown from this estimated 1980 level.

[D] The 1985 forecast is based on six years of growth at the rates shown from this 1979 level.

Figure 1

SAN FRANCISCO BAY AREA CARGO FORECAST
CONTAINERIZED GENERAL CARGO





Of the totals, most of the containerized cargo (62 percent in 1978) and most of the forecast growth (85 percent from 1978 to 1990) is cargo on Trade Route 29 between the U.S. Pacific Coast and the Far East. Continued growth and containerization is also forecast for the other Pacific Coast routes, including the South American, European, Indonesian, and other foreign trades. Only modest growth is forecast for domestic receipts and shipments. The containerized cargo forecasts are summarized for these three portions of the trade in Figure 1.

Imports and Exports on Trade Route 29

The forecast of containerized imports and exports reflects the historic high rates of growth observed on Trade Route 29, the major Pacific Coast and Bay Area route (about 80 percent of Pacific Coast and Bay Area foreign container trade). This high rate of growth is due both to the continuing development of Pacific Basin trade and to the growth in minilandbridge* traffic (though at rates below those experienced for MLB traffic between 1973 and 1977).

The forecast is supported by two separate analyses of Trade Route 29. The first analysis focused on the growth of both Trade Route 29 import and export containerizable cargo over the past 20 years (1959-1977). The second investigated the relationship between U.S. imports of Far East containerizable cargo and U.S. Gross National Product (GNP) over the same time period. Since imports and exports have historically increased at about the same rate, the GNP import analysis reflects both import and export growth.

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*Minilandbridge (MLB) traffic (including microbridge) includes cargos moving between the East and Gulf Coasts of the U.S. and the Far East, which move through West Coast ports and across the U.S. by rail, rather than utilizing the all-water route through the Panama Canal.

The baseline forecast takes the view that the potentials for growth of trade with Pacific Basin countries are sufficiently great to justify a forecast over the next decade that reflects a continuation of a high rate of growth (9.5 percent per year) similar to that experienced over the past 20 years and identified in the first analysis described above. This outlook reflects a greater propensity for trade in the U.S., the continuing shift of total U.S. trade to Pacific Basin countries, and the continuing shift of U.S. - Far East trade to the Pacific Coast. As a result, the growth of Pacific Coast trade will continue at rates that exceed the growth of total U.S. trade. The baseline forecast further assumes that this high rate of growth is unlikely to be maintained over the longer term so that beyond 1990, the forecast reflects a moderation of the growth rate to levels more similar to those supported by the analysis of the long-term relationship between Far East trade and U.S. GNP (approaching 5 percent per year beyond 2000).

Achievement of the baseline forecast requires the continued development of Pacific Basin and West Coast trade as would be supported by:

- Continued growth of trade with Taiwan, Hong Kong, and Korea, as large exporters to the U.S.;
- The continued development of trade with China, which is likely to be partly containerized and will contribute to the continued growth of Trade Route 29. Dramatic growth of container trade with China is not expected, at least not over the next ten to twenty years;
- Continued high levels of trade between U.S. and Japan, with potential competition among Pacific Basin countries for U.S. trade; and

- The growth of micro and minilandbridge cargo, which is expected to continue to shift additional Gulf and Atlantic cargo to the Pacific Coast, although at future rates of growth below those experienced 1973 - 1977.

Compared to the baseline forecast, the high scenario reflects greater growth in Pacific Basin trade. It projects a rate of growth over the 1978 - 1990 period which exceeds the high rate experienced over the past 20 years (10.5 percent per year through 1990, moderating to 5 percent in the 2000 - 2020 period). This high forecast would be supported by a higher Pacific Coast share of U.S. foreign trade, as could result from higher growth of trade with Far East industrialized and developing countries, particularly China, Taiwan, Hong Kong, and Korea.

The low scenario reflects lower growth in Pacific Basin trade. It is derived from the historical Far East trade - U.S. GNP relationship and current GNP forecasts, and includes an additional shift in U.S. - Far East trade to the Pacific Coast (forecasting 7.5 percent per year growth through 1990, and 5 percent thereafter). Compared to the baseline forecast, the low scenario reflects lower U.S. economic growth supporting less trade, the possible introduction of trading agreements to limit U.S. imports, and a less rapid growth of the Pacific Coast share of U.S. foreign trade which could be affected by increases in the exports of Far East products to non-U.S. markets (such as Japanese goods to European markets). It also reflects greater competition for U.S. trade among trading partners because of similarity of goods and economic limitations to U.S. trade growth.

The Bay Area is projected to maintain its competitive position vis-a-vis other West Coast ports for Trade Route 29 cargo and as a result, the Bay Area Trade Route 29 cargo is projected to grow at the same rates as the route as a whole. Recent experience through 1979 supports this assumption since prior declines in Bay Area share of foreign container cargo which were experienced through 1975 had stabilized through 1979. Early 1980 data for total containerized cargo, however, show a loss of share, although the reasons for this shift are not yet clear and the data are too recent to indicate a permanent renewal of past trends. Should data for future years continue to indicate a loss of Bay Area market share, this trend would support the lower forecast scenario.

Imports and Exports on Other Trade Routes

The forecast of containerized cargo also includes the continued growth and containerization of the South American, European, Indonesian, Australian, and other Pacific trade routes (including the India subcontinent). These forecasts were developed for the aggregate pattern of several routes, some of which will continue to experience higher growth and others which will grow at lower rates. Since many of these routes are already partly containerized and are expected to grow only moderately, overall tonnages are not expected to show major increases, particularly when compared to the high growth forecast for Trade Route 29.

The outlook for the baseline forecast is that future growth will be similar to the recent pattern of growth on these routes. The baseline forecast reflects the historic rate of growth in total liner tonnages for the 1973 - 1978 period (3.6 percent per year) and assumes the continued

containerization of breakbulk cargo (from 25 percent in 1985 to 85 percent by 2020). These factors combine to support a container cargo forecast of growth at 5.6 percent per year through 1990, moderating to 4.5 percent annually by 2000.

The baseline forecast recognizes the growth potentials for trade on these routes within the context of total Pacific Coast foreign container trade patterns (on Trade Route 29 and all other foreign routes) and overall U.S. economic growth. It assumes competition among emerging and current U.S. trading partners such that high growth on certain trade routes would at least partially replace or substitute for trade on other routes. These types of shifts have and will continue to occur.

The high and low scenarios reflect variations of both the growth of trade on these routes (3.0 percent to 4.5 percent) and the penetration of containerization (75 percent to 90 percent). Compared with the baseline forecast, the high scenario would be supported by a combination of higher U.S. economic growth and greater ability for foreign nations to purchase U.S. goods, particularly by oil exporting countries and in situations where the relative value of the dollar strongly favors U.S. exports. More rapid growth of trade would also support greater containerization. The low scenario reflects slowed growth of trade with developing nations, supported by slower U.S. economic growth and by lesser ability of foreign nations to purchase U.S. exports, particularly due to higher energy costs. Lower growth of trade would mean less shift from breakbulk to container.

Bay Area container trade is assumed to grow at the same rate as total West Coast container trade on these routes and to reflect the same shift to containerization. A potential loss of the Bay Area's market share of trade on these routes would support the low scenario.

Domestic Shipments and Receipts

Containerized domestic shipments and receipts are forecast to grow modestly from present levels in the baseline forecast. The recent declining trend has been due largely to the fall-off in Atlantic and Puerto Rican trade which is now at very low levels and cannot continue to decline at historic rates. Bay Area Hawaiian trade has also experienced some decline, but this pattern is expected to stabilize. Though some continued growth is expected in the Hawaiian trades, the combination of substitutions of imports for domestic products, of continued competition from other Pacific Coast ports, and the the possibility of moderate overall growth of the Hawaiian economy is expected to keep growth at moderate levels (about 1.5 percent to 1.25 percent per year in the baseline forecast or half the rate of forecasted U.S. GNP growth).

In the high scenario, domestic container trade is projected to grow at about the rate of overall U.S. GNP growth (3.0 percent through 1990, then declining to 2.5 percent). This rate is similar to the historic growth of Pacific Coast-Hawaiian trade over the past 20 years and higher than the historic growth of Bay Area Hawaiian trade. Compared with the baseline forecast, this scenario reflects higher growth of Bay Area Hawaiian trade as would be supported by higher Pacific Coast-Hawaiian trade growth and by maintenance of the Bay Area's current share of this trade. It also includes the possibility for future growth of intercoastal trade. The low scenario projects the current level of trade, reflecting a combination of lower Hawaiian trade growth and further shift in trade from the Bay Area to other West Coast ports.

Revenue Ton Forecast

The container forecast shown previously in Table 7 can also be expressed in revenue tons, as shown below in Table 10, by applying the derived 1978 short ton/revenue ton ratio of 1.96 for the foreign trade portion of the container forecast and adding in the domestic portion at 1.1 revenue tons per short ton.* Increases in the revenue ton/short ton ratio identified in Appendix C further increase the growth rates for containerized revenue tons. The estimated revenue ton forecast shows compound annual growth rates somewhat higher than the short ton forecast growth rates (see Table C-5 on page 149).

Table 10

SAN FRANCISCO BAY AREA
CONTAINER REVENUE TON ESTIMATE
FOREIGN AND DOMESTIC CARGO
(thousands of revenue tons)

	1978	% Growth	1985	% Growth	1990	% Growth	2000	% Growth	2020
Baseline	8,850	8.4%	15,573	8.6%	23,523	5.3%	39,582	4.9%	102,594
High	8,850	9.7	16,866	9.6	26,682	5.9	47,245	5.0	124,730
Low	8,850	6.6	13,847	6.8	19,233	4.8	30,619	4.8	77,839

Source: Table 7 and revenue ton/short tons ratios, as discussed in Appendix C.

The growth rates for the revenue ton forecast are higher than those for the short ton forecast because the revenue ton estimates include the effect of future increases in the spatial

*See Appendix C for the source of these ratios.

aspect or volume of cargo (referred to as cargo "cubic") relative to increases in the weight.* The higher growth rates for the revenue ton forecast reflect both higher rates of growth in the more cubic trades (those with greater spatial volume per short ton) and the continued increase in the spatial volume (or cubic) of the cargo moved per short ton.** These factors are significant because the demand for container terminal capacity will tend to increase more nearly in line with the growth of the volume or cubic of the cargo than with the growth of weight tons. The difference in growth rates indicates that the use of container terminal capacity will continue to increase faster than the increase in short tons of cargo.

In order to quantify an estimated potential impact on the demand for facilities of the revenue ton growth shown in Table 10, the growth rates in revenue tons were assumed to be applicable to the base year short tons shown in Table 7 and used to predict future levels of short tons which reflect future capacity requirements measured in current short tons. In general, the results are approximately 8 - 10 percent above the 1990 container short tons in Table 7 and 17 - 19 percent above the 2020 short tons. For

* Examination of the various systems for measuring cargo movements in Appendix C indicated that a measure of the spatial aspect or volume of container cargo is more useful for terminal facility planning purposes than a measure of weight tons since it provides a better indication of the increase in containers handled. As explained, the cubic or volume of container cargo has been increasing faster than the weight. The analysis indicated that the growth rate of revenue tons has been higher than the rate for weight tons partly because the revenue ton statistics include the effect of increases in cargo cubic. The growth rates for the revenue ton forecasts presented here are higher than the rates for the short ton forecast because they include estimates of the future increases in cargo cubic.

** It should be noted that the revenue ton forecast incorporates only the factors that could be expected to affect the demand for terminal capacity. This is relevant for future monitoring efforts since actual revenue tonnages in future years could differ from the forecasts to the extent that other factors also affect the revenue ton growth rates (see Appendix C).

example, Table 10 shows 1990 revenue tons to increase by 166 percent from the 1978 tonnage level. If the 1978 short tons of container cargo increased by the same proportion, the forecast for 1990 would rise to 13.3 million short tons, which is 10 percent above the 1990 forecast of 12.1 million short tons. The significance of this is that the 1990 levels of terminal capacity will be required to be up to 10 percent greater in short ton capacity as measured today to accommodate the more cubic cargos of the future. By 2020 the required levels of capacity will need to be up to 17 - 19 percent above the short ton cargo volume forecast if the capacities are measured in current short tons.*

Breakbulk General Cargo

The forecast of breakbulk cargo reflects the continued growth of liner cargo on the South American, European, and other foreign routes serving the Bay Area and the shift of breakbulk cargo to containers, particularly in the trades with developing nations. The result of these two trends is a forecast, for the baseline scenario, of a slowly declining level of breakbulk trade as the shift to container (25 percent in 1985 to 85 percent in 2020) is forecast to overcome the overall growth of trade (at 3.6 percent per year).

The low breakbulk forecast occurs with the high container scenario since more rapid growth of these trades would also mean greater containerization. Similarly the high breakbulk forecast occurs with the lower container forecast. In both cases, however, breakbulk cargo is forecast to decline from percent levels. The amount of decline ranges from slight change to a decline of 30 - 40 percent (see Figure 2).

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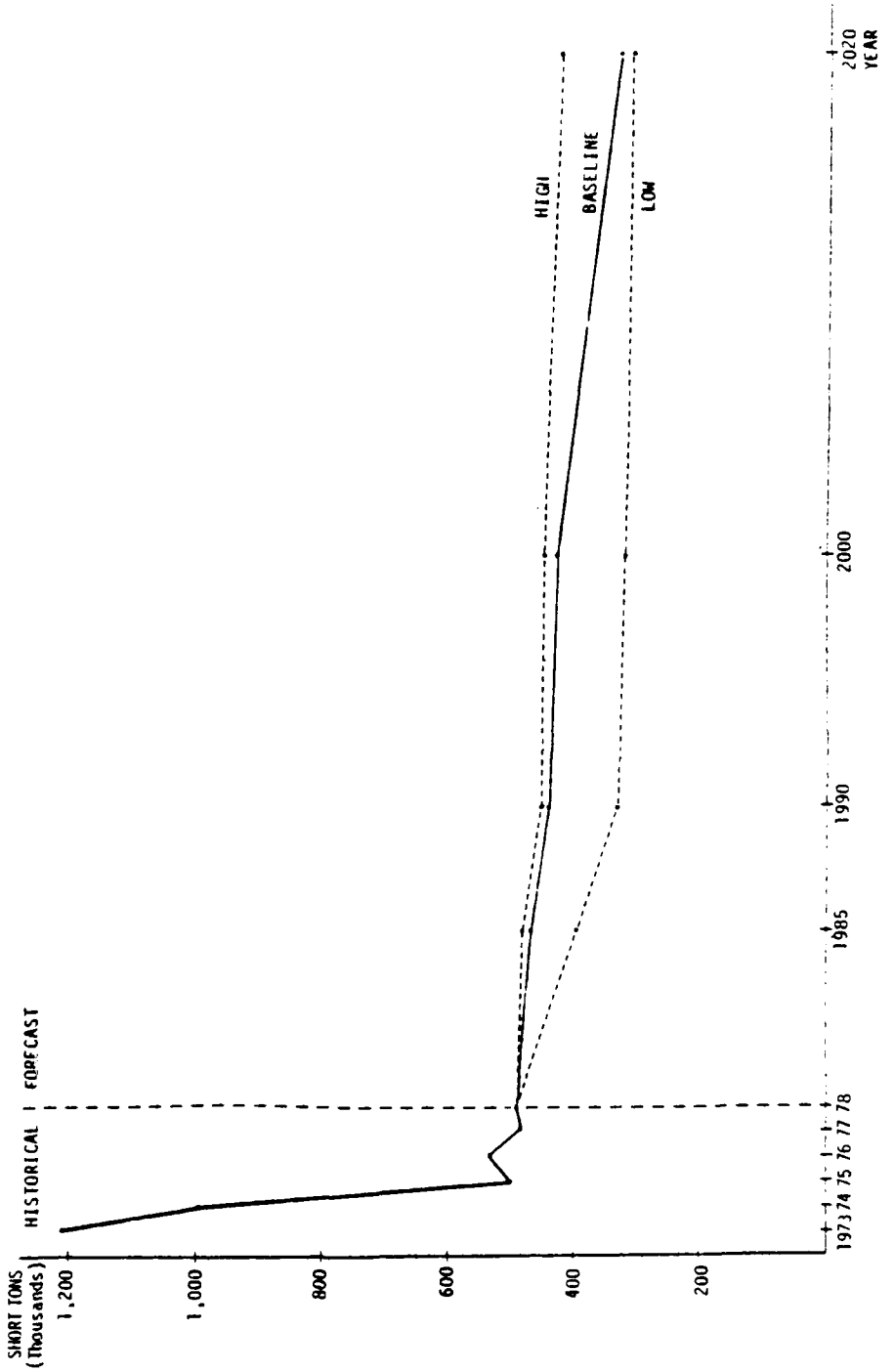
*While these estimated growth rates are useful for facility planning purposes, caution should be exercised in their use. As noted in Appendix C, there are many factors affecting the growth of revenue tonnage and the impact of cargo cubic on facilities that could not be fully considered in this study.

Figure 2

SAN FRANCISCO BAY AREA CARGO FORECAST
BREAKBULK GENERAL CARGO



Neobulk Cargo

Steady growth is forecast for Bay Area neobulk cargo, including automobiles and motor vehicles, iron and steel products, and newsprint. For the baseline, 1978 tonnages of 1.5 million short tons are forecast to increase to 2.0 million by 1990 and to 2.3 million by 2000. Within the neobulk cargo group, imports of automobiles and of iron and steel products represent the largest tonnages and most of the forecast growth (see Figure 3).

Automobiles and Motor Vehicles

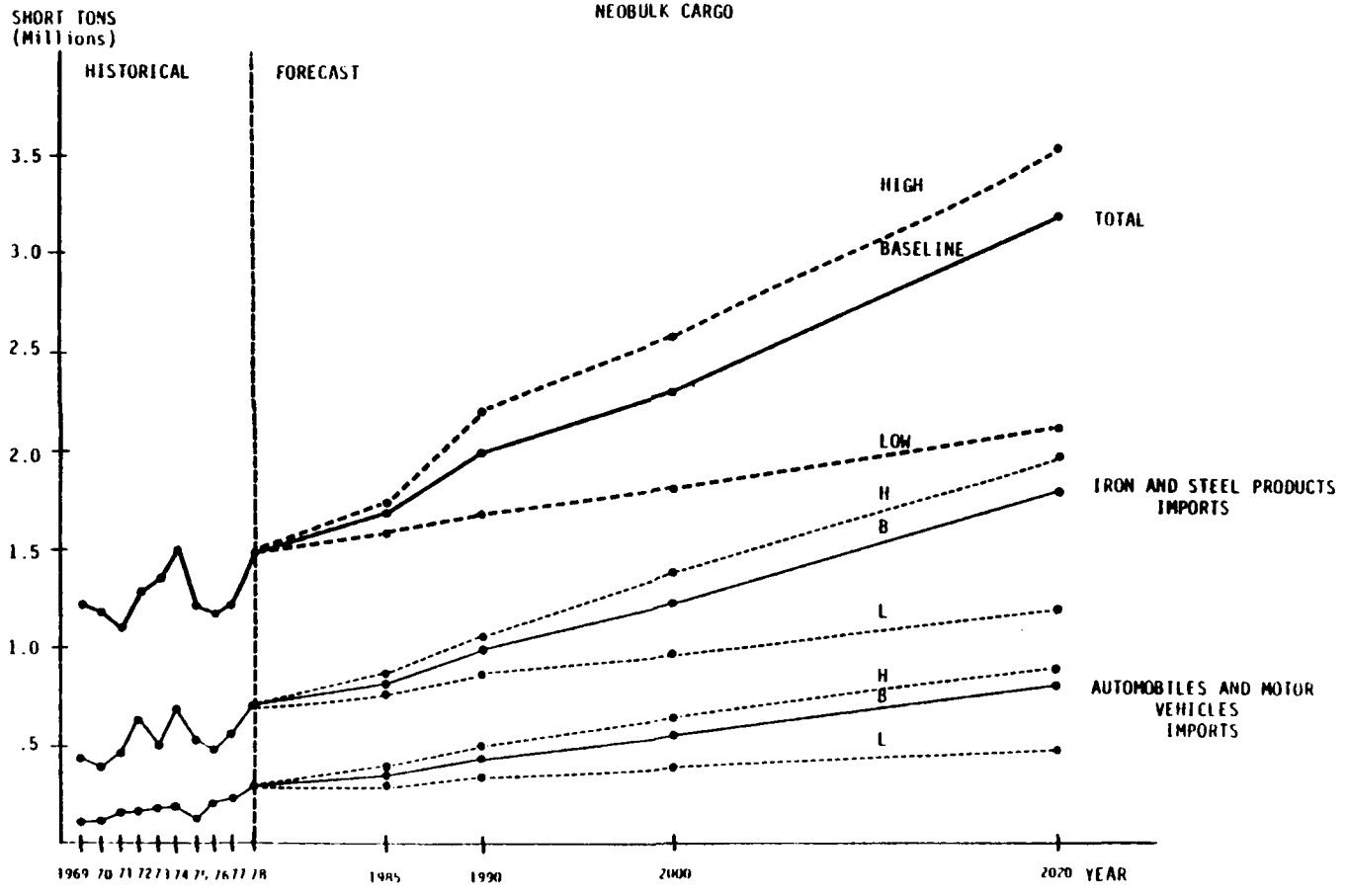
The Bay Area auto forecast reflects continuing growth of Japanese imports over the next ten years, with moderating growth over the longer term. Specifically, for the next decade, it reflects:

- Steady growth of overall U.S. auto demand at a fairly low level (2 percent per year) after a slow recovery from the 1980 recession;
- Stabilizing import market share (below recent high levels and at previously sustained levels of about 20 - 22 percent) as U.S. domestic production picks up, foreign manufacturers develop production in the U.S., and import controls or voluntary restraints moderate import participation in the U.S. market;
- Continued dominance of the import market by the Japanese, encouraging West Coast imports to grow more rapidly than total U.S. imports; and
- The ability of Bay Area to maintain its present share of Pacific Coast imports after recovery from a recent shift due to the development of auto handling facilities in the Pacific Northwest.

Figure 3

SAN FRANCISCO BAY AREA CARGO FORECAST

NEOBULK CARGO



The result is a baseline forecast for Bay Area auto imports growing at about 4 percent per year through 1990. Beyond that time, Pacific Coast imports are expected to keep pace with the growth in total market demand of 2 percent annually.

The high and low forecasts reflect variations in the level of imports based on the success of U.S. manufacturers in producing competitive models, on the extent of production in the U.S. by foreign manufacturers, and on the effect of import controls. They also reflect variations in the Bay Area's share of Pacific Coast import trade.

Domestic shipments and receipts and foreign exports of autos are projected to continue at present levels. There may be some trend toward an increase in foreign exports as U.S. manufacturers enter new foreign markets, but U.S. producers are expected to continue to produce autos for foreign sales in overseas plants. Similarly, shipments of autos to Hawaii could grow slightly, but competition from both Japanese producers and other Pacific Coast ports will tend to limit that growth.

Iron and Steel Products

Steady growth is forecast for Bay Area iron and steel imports. The forecast is based on a recovery of demand in the early 1980s (from the recent decline due to the recession and the impact of trigger prices) and continued growth beyond 1982 in demand for imports in the U.S. Western steel market.*

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*Western market, as defined in the Kaiser Steel Annual Report, includes Arizona, California, Idaho, Nevada, Oregon, Utah, and Washington.

The inability of U.S. producers to expand steel capacity due to the poor financial performance of the domestic steel industry in recent years will encourage imports through the 1980s. Even into the 1990s, favorable transportation economics will allow Western market imports to maintain their market share.

The baseline forecast through 1990 assumes that imports will capture all of the growth of the Western steel market, increasing their market share from 43 to 52 percent. Beyond 1990, domestic capacity is expected to meet half of the market growth. The Western market as a whole is forecast to grow at 2 percent per year, in line with industry estimates of 1 to 2 percent for demand nationally. In all scenarios, the Bay Area is assumed to maintain its current share of Pacific Coast imports, which has been stable over the past ten years.

Compared with the baseline forecast, the high scenario considers continued penetration of imports (to 60 percent of the Western market in 1990) and some displacement of domestic production. The low scenario largely reflects lower overall growth in Western market demand (at 1 percent per year).

Other iron and steel movements are forecast at current levels. Domestic shipments primarily to Hawaii for use in construction and manufacturing are expected to continue at present levels. Increases in shipments are limited by increased competition from foreign producers and with other Pacific Coast ports. Foreign exports are also forecast at present levels since certain U.S. steel products are competitive in the world market--such as sheet steel--and can be expected to continue to be exported at current levels.

Newsprint

The forecast for Bay Area newsprint imports incorporates the very gradual growth observed in the past ten years and anticipates a continuation of current trade patterns. The result is a baseline forecast that projects growth of 1 percent per year. As in the past, the growth of newsprint is expected to keep pace with Bay Area population growth. The high and low scenarios consider the possibilities that growth would occur at 2 percent through 1990 and 1 percent thereafter (high level) and that tonnages remain stable at the 1980 level (low level).

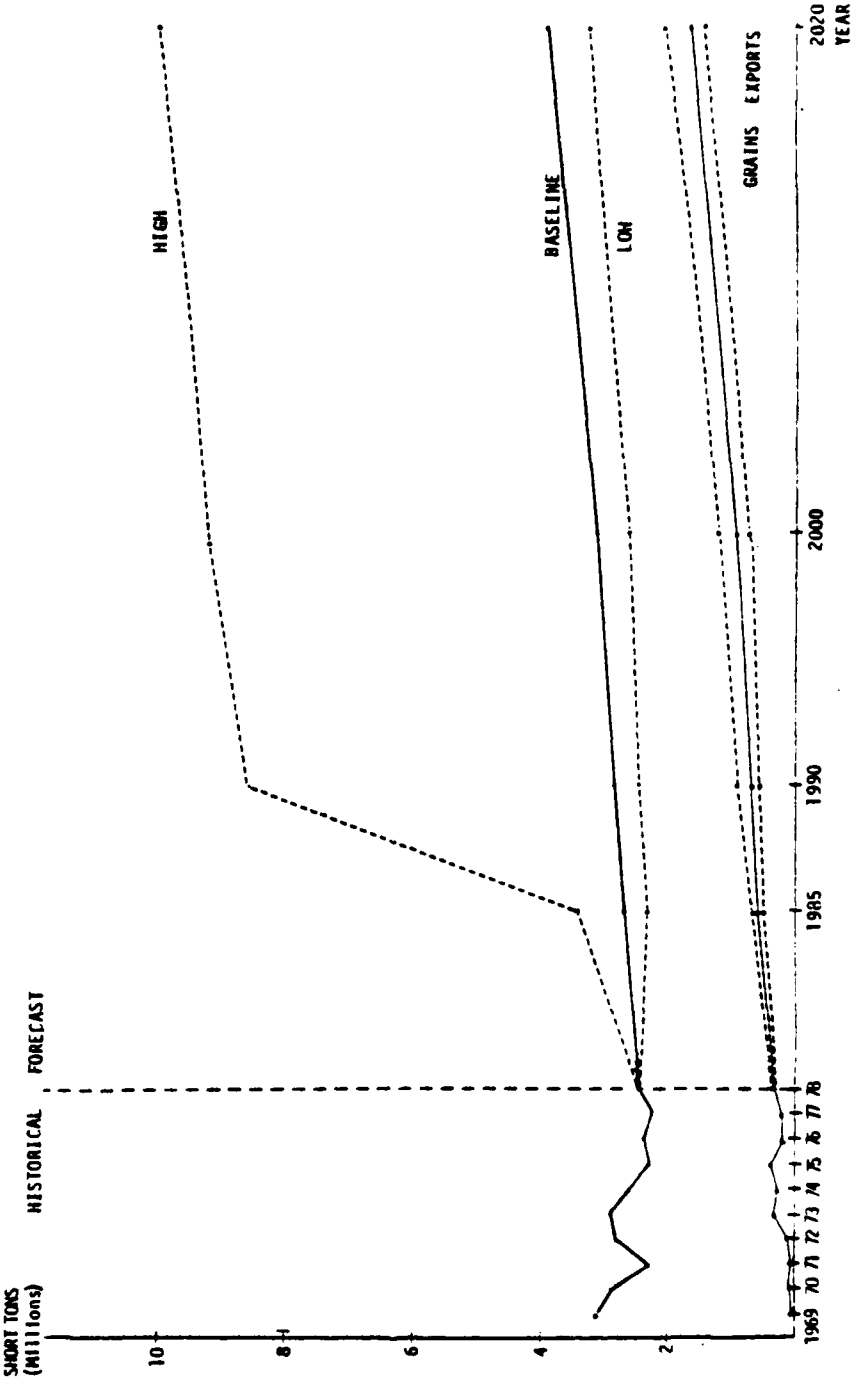
Dry Bulk Cargo

Bay Area dry bulk cargo is forecast to grow modestly under the baseline forecast, with most of the growth being grain exports (see Figure 4). Under the low scenario, cargo is stable through 2000 while the high scenario shows significant growth during the late 1980s from major new facilities for cement/limestone imports and coal exports.

Grains

Growth of Bay Area grain exports is forecast at high rates through the 1980s. This reflects such recent developments as the increase in trade with China, Korea, Japan, and Russia. Though grain is significant in the Bay Area, Stockton/Sacramento, the Pacific Northwest, and Los Angeles/Long Beach are expected to continue to ship the majority of the Pacific Coast trade. The Bay Area will benefit, however, from the continued growth of the Stockton/Sacramento trade since vessels often "top-off" in San Francisco after loading in the Delta.

Figure 4
SAN FRANCISCO BAY AREA CARGO FORECAST
DRY BULK CARGO



The baseline forecast picks up the high growth of Bay Area exports that has occurred since 1978 and includes continued growth at 6 percent per year through 1985 and 3 percent per year thereafter. The high and low scenarios reflect different rates of growth ranging from 3 to 8 percent per year through the 1980s and both assume 3 percent per year thereafter. The 3 percent long-term rate is based on a recent U.S.D.A. forecast of grain exports which projected long-term growth between 2 and 3 percent for wheat, corn, and rice--the major Bay Area grains. Though all of the forecasts show steady growth over the years, grains will continue to show fluctuations as weather and world markets influence the year-to-year demand for U.S. grain.

Domestic shipments are forecast to experience steady growth at historic rates of 2 or 3 percent.

Other Dry Bulk

The forecasts for the remaining dry bulk cargos primarily reflect historic tonnages, modified as appropriate for the current operations and future plans of major Bay Area facilities. This includes the forecasts for iron and steel scrap, petroleum coke, sugar, salt, limestone, and coal.

The baseline forecasts for these commodities generally reflect current tonnages. For scrap, coke, sugar, and salt, no major changes in tonnages are expected and no new Bay Area facilities are currently being planned. The high and low scenarios reflect the range in historic tonnages, with the high at recently experienced high tonnages and the low at previous low levels. In addition, the high forecast includes 5 million

tons of coal exported from the Bay Area by 1990 and 400,000 tons of limestone imports by 1985 for the potential cement facility at Redwood City. They are included only in the high scenario because of the uncertainty that surrounds these commodities.

COMPARISON WITH PREVIOUS FORECASTS

Tables 11 and 12 compare the tonnage forecasts and rates of growth from previous Bay Area forecasts with the TBS/RHA forecast. Table 11 also allows a comparison between the 1978 actual tonnages and the 1980 forecasts from previous efforts and indicates that projected tonnages have not been reached.*

The TBS/RHA forecast agrees more closely with the Army Corps and MTC low forecasts but projects less rapid development of dry bulk and breakbulk (includes neobulk) cargos than the previous forecasts. For those future years where the TBS/RHA forecast is similar to previous forecasts (such as for container cargo in 1990 compared to the MTC low and for container in 2000 compared with the Corps), the TBS/RHA forecast assumes a higher rate of growth in future years since it starts with a lower base amount. For example, the 2000 container forecasts by TBS/RHA and the Corps are nearly the same (see Table 11). The TBS/RHA forecast, however, begins at 5.0 million short tons in 1978 and reflects 6.4 percent annual growth over the 22 years. The Corps forecast begins at 6.4 million short tons in 1980 and reflects 5.7 percent per year growth over that period.

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*Actual growth of Bay Area dry cargo was 1.1 percent per year 1973-1978, while the 1973-1980 growth was forecast at 4.8 percent in the Corps forecast and at 4.1 percent in the NORCAL and MTC low. See note in Table 12.

Table 11

SAN FRANCISCO BAY AREA
COMPARISON OF DRY CARGO PROJECTIONS
(millions of short tons)

	1980	1990	2000	2020
TBS/RHA	(1978)			
Container	5.0	12.1	19.6	49.0
Breakbulk[A]	2.0	2.4	2.7	3.5
Dry Bulk	2.5	2.8	3.1	3.9
Total	9.5	17.3	25.4	56.4
NORCAL				
Container	6.0	16.8	30.0	85.0
Breakbulk	3.9	4.2	5.0	14.0
Dry Bulk	3.6	6.0	8.0	23.0
Total	13.5	27.0	43.0	122.0
Corps				
Container	6.4	--	19.5	32.7
Breakbulk	3.7	--	4.1	6.7
Dry Bulk	4.1	--	8.1	15.5
Total	14.2	--	31.8	54.9
MTC Low Forecast[B]				
Container	6.1	11.4	18.9	34.9
Breakbulk	3.5	3.7	4.0	7.1
Dry Bulk	3.9	5.6	8.1	16.5
Total	13.5	20.8	31.0	58.5

NOTE: Totals may not add due to rounding

[A]Includes breakbulk and neobulk cargo forecasts.

[B]The low forecast was prepared by consultants during Phase I of the MTC/BCDC Port Planning Project. It represents the Seaport Planning Advisory Committee's adopted low forecast; the NORCAL forecast is the adopted high forecast.

Table 12

SAN FRANCISCO BAY AREA
DRY CARGO PROJECTIONS
COMPARISON OF ANNUAL COMPOUND GROWTH RATES

	1980-1990	1990-2000	2000-2020	1980-2020
Total Trade[C]				
TBS/RHA[A]	5.1%	3.9%	4.1%	4.3%
Corps[B]	4.1	4.1	2.8	3.4
NORCAL	7.2	4.8	5.4	5.7
MTC low	4.4	4.1	3.2	3.7
Container				
TBS/RHA[A]	7.6	4.9	4.7	5.6
Corps[B]	5.7	5.7	2.6	4.2
NORCAL	10.8	6.0	5.3	6.9
MTC low	6.5	5.2	3.1	4.5
Breakbulk				
TBS/RHA[A]	1.5	1.2	1.3	1.3
Corps[B]	0.5	0.5	2.5	1.5
NORCAL	0.7	1.8	5.3	3.2
MTC low	0.6	0.8	2.9	1.8
Dry Bulk				
TBS/RHA[A]	1.0	1.0	1.2	1.1
Corps[B]	3.5	3.5	3.3	3.4
NORCAL	5.2	2.9	5.4	4.7
MTC low	3.7	3.8	3.6	3.7

[A]TBS/RHA growth rates were computed for 1978 to 1990 and 1978 to 2020

[B]The Corps forecast does not report 1990 tonnage, growth is assumed to be the same 1980 to 1990 and 1990 to 2000.

[C]1950-1973 growth was at 3.5 percent annually. 1973-1980 growth was forecast at 4.8 percent in the Corps forecast and at 4.1 in NORCAL and MTC low, actual 1973-1978 rate has been 1.1 percent.

FOLLOWING CHAPTERS

The rest of this report is composed of eleven chapters discussing the details of recent trade and presenting the cargo forecast for each of the eleven cargo groups.

- Containerized General Cargo;
- Breakbulk General Cargo;
- Autos and Motor Vehicles;
- Iron and Steel Products;
- Newsprint;
- Grain;
- Iron and Steel Scrap;
- Coke;
- Sugar;
- Salt; and
- Other Bulk

Each chapter reviews recent trade, identifies the major factors affecting the trade, and presents the baseline forecast and high and low scenarios. The chapters are followed by three appendices--Appendix A reviewing the cargo groups used to analyze and forecast Bay Area dry cargo, Appendix B providing background on the container cargo statistics, and Appendix C explaining the revenue ton/short ton relationship for container cargo.

II. CONTAINERIZED GENERAL CARGO

Between 1973 and 1978 Containerized General Cargo has grown from 45.1 percent of the San Francisco Bay dry cargo trade to 53.1 percent. Foreign exports have been the highest volume of trade but domestic shipments, foreign imports, and domestic receipts are all major components. Foreign moves have grown appreciably in recent years while domestic moves have declined. Overall, container traffic has grown slowly from 4,457,896 tons in 1973 to 5,009,342 in 1978 at a compound annual rate of 2.36 percent. Over the same period, as domestic container has declined, foreign container trade has grown from 48.3 percent of Bay Area container in 1973 to 77.5 percent in 1978. Table 13 presents recent movements by direction. As discussed in Chapter I, the containerized cargo data were compiled from the MarAd MA578A data (Supplemental Unitized Cargo Container Reports) and were reviewed and adjusted by TBS to insure their accuracy. Appendix B provides detail on the review and the adjustments that were made.

TABLE 13

SAN FRANCISCO BAY AREA
CONTAINERIZED GENERAL CARGO
(short tons)

	Foreign		Domestic	
Year	Imports	Exports[A]	Receipts	Shipments
1973	556,443	1,597,253	853,797	1,450,403
1974	773,274	1,791,906	750,548	1,304,393
1975	710,914	1,694,413	479,595	1,115,394
1976	941,784	1,956,925[B]	484,239	1,060,563
1977	1,260,940[C]	2,153,489[B]	433,805	918,602
1978	1,225,423[C]	2,657,686	367,870	758,363

Sources: Foreign - Supplemental Unitized Cargo Container Reports, MarAd.
Domestic - Waterborne Commerce of the United States, Army Corps of Engineers - Oakland/San Francisco Dry Cargo traffic excluding neobulk and dry bulk, see also Table 1, Chapter I.

[A] Includes approximately 300,000 tons of military cargo.

[B] Adjusted downward by 400,000 tons, see Appendix B for discussion.

[C] Adjusted upward by 300,000 tons, see Appendix B for discussion.

FOREIGN EXPORTS

Foreign exports of containerized cargo from the Bay Area, shown in Table 14, have grown from 1973-1978 at a compound annual rate of 10.7 percent. The major trading partners have been Japan, Hong Kong, Taiwan, Korea, and Singapore. The Bay Area export growth has been significant, however higher growth rates have been experienced by Los Angeles and the Pacific Northwest.

Table 14

PACIFIC COAST PORTS
CONTAINERIZED GENERAL CARGO EXPORTS
(short tons)

Year	Oakland/ San Francisco	Los Angeles/ Long Beach	Seattle	Tacoma
1973	1,597,203	1,447,485	556,116	82,958
1974	1,791,906	1,715,716	676,755	49,635
1975	1,694,413	1,825,372	672,875	43,702
1976	1,956,926	2,059,137	943,647	46,663
1977	2,153,489[A]	2,434,340	1,188,790	46,057
1978	2,657,685	2,917,299	1,144,872	167,216

[A] Adjusted downward by 400,000 tons, see Appendix B for discussion.

Source: Supplemental Unitized Cargo Container Reports, Maritime Administration. Includes military cargo.

As shown in Table 15, California exports have grown at a compound annual rate of 12.8 percent over the 1973-1978 period, while the Pacific Northwest exports have grown more rapidly at 15.0 percent. Both regions have grown more rapidly than the 10.0 percent rate of total U.S. containerized exports.

Table 15

PACIFIC COAST
CONTAINERIZED GENERAL CARGO EXPORTS
(short tons)

Year	California[A]	Pacific Northwest[A]	Total United States
1973	3,057,089	391,563	11,015,600
1974	3,518,882	1,001,248	13,432,200
1975	3,529,119	1,015,650	13,737,400
1976	4,016,461[B]	1,388,773	15,516,500
1977	4,588,734	1,635,337	15,450,900[B]
1978	5,581,722	1,794,080	17,734,800

[A] Includes cargo in addition to that handled in the major ports shown in Table 14.

[B] Adjusted downward by 400,000 tons, see Appendix B for discussion.

Source: Supplemental Unitized Cargo Container Reports, Maritime Administration. Contains military cargo.

FOREIGN IMPORTS

Bay Area containerized imports, shown in Table 16, have remained below exports in tonnage but have grown more rapidly than exports at a rate of 17.1 percent between 1973 and 1978. Japan, Hong Kong, and Taiwan have been the major trading partners. Over the same period, containerized imports to Los Angeles/Long Beach have grown at a slightly lower rate while Seattle and Tacoma have grown somewhat more rapidly.

Table 16

PACIFIC COAST PORTS
CONTAINERIZED GENERAL CARGO IMPORTS

(short tons)

Year	Oakland/ San Francisco	Los Angeles/ Long Beach	Seattle	Tacoma
1973	556,443	1,408,674	550,529	23,784
1974	773,274	1,882,303	571,480	46,264
1975	710,914	1,690,112	662,326	39,723
1976	941,784	2,528,854	996,734	96,648
1977	1,260,940	3,077,496	1,212,198	103,854
1978	1,225,423 A	2,870,145	1,337,981 A	126,391

Source: Supplemental Unitized Cargo Container Reports, Maritime Administration, includes military cargo.

A. adjusted upward by 300,000 tons. Seattle has been reduced by the same amount, see Appendix B for discussion.

As shown in Table 17, the Pacific Northwest has increased foreign imports at a slightly more rapid rate than California over the 1973-1978 period, growing at a rate of 18.5 percent annually compared to 15.7 percent. Both regions have outpaced the growth in total U.S. containerized imports of 10.4 percent per year.

Table 17

PACIFIC COAST
CONTAINERIZED GENERAL CARGO IMPORTS
(short tons)

Year	California[A]	Pacific Northwest[A]	Total United States
1973	1,979.884	688,116	9,864,100
1974	2,660,621	732,333	11,622,300
1975	2,404,581	826,277	11,722,700
1976	2,470,863	1,244,210	14,527,500
1977	4,345,522	1,466,323	15.872.000
1978	4,108,512[B]	1,609,199[B]	16,196,600

[A]Includes cargo in addition to that handled in the major port areas shown in Table 16.

[B]California adjusted upward by 300,000 tons; Pacific Northwest reduced by the same amount; see Appendix B for discussion

Source: Supplemental Unitized Cargo Container Reports, Maritime Administration. Contains military cargo.

TOTAL FOREIGN TRADE

In combination, Bay Area imports and exports have shown substantial growth at a compound annual rate of 12.5 percent from 1973 to 1978. This rate is higher than containerized cargo growth for the total U.S. (10.2 percent) and slightly lower than the rate experienced for the total Pacific Coast (14.6 percent). From 1975 to 1978, Bay Area share of Pacific Coast foreign containerized cargo has been fairly stable at about 30 percent (see Table 18).

Table 18

CHANGES IN BAY AREA AND PACIFIC COAST SHARES
FOREIGN CONTAINER CARGO

Year	Total United States (short tons)	Total Pacific Coast (short tons)	Pacific Coast as Share of United States (percent)	Total Bay Area (short tons)	Bay Area as Share of Pacific Coast (percent)
1973	20,879,700	6,616,653	31.7	2,153,646	32.5
1974	25,054,500	7,913,084	31.6	2,565,180	32.4
1975	25,460,100	7,775,627	30.5	2,405,327	30.9
1976	30,044,000	9,120,307	30.4	2,898,710	31.8
1977	31,122,900	12,015,916	38.4	3,414,429	28.4
1978	33,931,400	13,093,513	38.6	3,883,108	29.7

Source: Tables 14, 15, 16, and 17.

DOMESTIC SHIPMENTS AND RECEIPTS

Domestic shipments and receipts, shown previously in Table 13, have fallen significantly from 2,304,200 tons in 1973 to 1,126,233 tons in 1978, at a compound annual rate of decline of 13.3 percent. Much of this decline has been in the North Atlantic and Puerto Rican trades which are now at very low levels as shown in Table 19. The suspension of Sea-Land's intercoastal service between the Pacific and Atlantic Coasts has been the major factor in this decline. The Hawaiian trade in the Bay Area, shown in Table 20, has also declined. This is due to a slight decline in total Pacific Coast - Hawaiian trade and to a shift to Los Angeles/Long Beach. Trade with the Trust Territories has been stable at relatively low levels.

Table 19

SAN FRANCISCO BAY[A]
PRINCIPAL DOMESTIC CONTAINER TRADES
1973-1978

Year	Hawaii	North Atlantic[B]	Trust Territories	Puerto Rico	Total
1973	1,392,787	524,456	245,308	148,249	2,310,810
1974	1,271,392	640,193	127,502	230,209	2,269,296
1975	1,261,723	391,631	110,244	150,784	1,914,382
1976	1,128,042	394,974	193,298	168,629	1,884,944
1977	1,109,439	201,604	173,143	140,971	1,625,057
1978[C]	1,077,321	31,940	212,743	29,101	1,351,105

[A] Tonnages shown are not entirely comparable with Table 13 due to inclusion of certain commodities excluded from Table 13 and to differences in sources but do reflect origin and destination of cargo.

[B] Excludes Richmond iron and steel products to derive container trade.

[C] Represents preliminary data subject to revision.

Source: Domestic Waterborne Commerce of the United States, 1973-1978, U.S. Maritime Administration.

Table 20

PACIFIC COAST-HAWAIIAN TRADE[A]
1973-1978
(short tons)

Year	Los Angeles/ Long Beach	Percent	Oakland/ Alameda[B]	Percent	Portland	Percent	Seattle	Percent	Total
				Receipts					
1973	136,158	20.5	474,001	71.4	22,889	3.4	30,905	4.7	663,953
1974	154,555	27.5	381,257	67.8	13,312	2.5	13,138	2.3	562,262
1975	188,599	33.1	348,012	61.0	20,221	3.5	13,575	2.4	570,407
1976	161,013	32.7	297,398	60.5	19,207	3.9	14,220	2.9	491,838
1977	246,526	39.6	318,427	51.2	17,877	2.9	39,208	6.3	622,038
1978	238,275	43.2	288,626	52.3	10,261	1.9	14,742	2.7	551,904
				Shipments					
1973	428,918	27.9	869,125	56.6	106,185	6.9	130,465	8.5	1,534,693
1974	616,572	37.4	737,001	44.7	102,172	6.2	192,467	11.7	1,648,212
1975	592,085	35.6	741,086	44.5	133,291	8.0	198,880	11.9	1,665,342
1976	571,519	39.0	646,934	44.2	97,238	6.6	149,269	10.2	1,464,960
1977	653,073	40.4	727,087	45.0	88,534	5.5	148,025	9.2	1,616,719
1978	633,443	42.5	644,100	43.2	83,999	5.6	129,561	8.7	1,491,103
				Total					
1973	565,076	25.7	1,343,126	61.1	129,074	5.9	161,370	7.3	2,198,646
1974	771,127	34.9	1,118,258	50.6	115,482	5.2	205,605	9.3	2,210,472
1975	780,684	34.9	1,089,098	48.7	153,512	6.9	212,455	9.5	2,235,749
1976	732,532	37.4	944,332	48.3	116,445	6.0	163,489	8.4	1,956,798
1977	899,599	40.2	1,045,514	46.7	106,411	4.8	187,233	8.4	2,238,757
1978	871,718	42.7	932,726	45.7	94,260	4.6	144,303	7.1	2,043,007

[A]Excludes automobiles, residual fuel oil, molasses, and dry cargo carried on barges to approximate containerized cargo.

[B]In comparison with Table 19, tonnages here are for Oakland/Alameda only, while tonnages in Table 19 are for total Bay Area-Hawaiian trade. As noted in Table 19, the tonnages from this source are not entirely comparable with Table 13.

Source: Domestic Waterborne Commerce of the United States, 1973-1978. Maritime Administration, Office of Domestic Shipping.

KEY FACTORS

Foreign Imports and Exports

Table 21 shows that about 80 percent of California and, as noted, Bay Area foreign containerized cargos have been on Trade Route 29--serving Japan, Korea, Hong Kong, Taiwan, and China. The major factor in future Bay Area container trade will be the continued growth on this route.

Other routes have contributed significant but lesser volumes of container cargo. These routes include trade with South American, European, and other Pacific countries including the India subcontinent. Many of these trades, shown later in Table 29, serve developing nations where future growth in container traffic will depend on both the overall growth of tonnages and the shift from breakbulk to containerization.

Domestic Shipments and Receipts

Future domestic cargos depend primarily on the Hawaiian trade which represented about 80 percent of Bay Area domestic container in 1978. Other factors include trade with the Trust Territories and potentially the Atlantic and Puerto Rican trades although these have declined to very low levels.

FORECAST APPROACH

The forecast of containerized cargo was developed by separately projecting the three major components of the trade:

- Trade Route 29 (U.S. Pacific Coast - Far East);
- Other Pacific Coast routes (U.S. - South America, Europe, Australia, Indonesia, India, Africa, etc.); and
- Domestic shipments and receipts (Hawaii, Guam, Puerto Rico, etc.)

Table 21

CALIFORNIA CONTAINERIZED CARGO
(long tons)

Year	California to Far East Trade Route 29	California to Europe Trade Route 26	California To Mediterranean Trade Route 65	California to Australia Trade Route 27	California to Indonesia Trade Route 17	California to East Coast South America Trade Route 24	California to West Coast South America Trade Route 25	California
				Imports				
1973	1,397,409	262,103	33,413	29,000	10,118	12,232	12,428	1,767,754
1974	1,884,535	296,379	54,452	56,617	16,706	17,828	22,156	2,375,555
1975	1,708,398	207,840	53,309	64,712	12,137	23,862	24,021	2,146,947
1976	2,477,280	245,057	90,488	99,028	43,670	35,721	37,281	3,098,985
1977	3,092,740 [A]	326,244	124,368	109,702	83,033	33,007	26,499	3,879,930 [A]
1978	2,928,883 [A]	371,355	95,711	131,414	86,037	26,840	20,657	3,700,457 [A]
				Exports				
1973	2,207,718	317,016	34,167	45,074	42,670	14,416	26,912	2,729,544
1974	2,538,758	326,601	9,935	105,436	66,280	22,069	31,179	3,141,859
1975	2,508,381	297,526	16,672	91,643	128,832	19,849	23,983	3,150,999
1976	2,717,429 [B]	328,692	44,237	132,360	227,481	18,515	29,027	3,586,126 [B]
1977	3,025,579 [B]	350,361	83,268	139,457	318,347	23,567	31,173	4,054,227 [B]
1978	3,953,281	324,574	83,863	210,091	283,809	19,379	14,351	4,983,680
				Total				
1973	3,605,127	579,119	67,580	74,074	52,788	26,648	39,340	4,497,298
1974	4,423,293	622,980	64,387	162,053	82,986	39,897	53,335	5,517,414
1975	4,216,779	505,366	74,981	156,355	140,969	43,711	48,004	5,297,946
1976	5,194,709	573,749	134,725	231,388	271,151	54,236	66,308	6,685,111
1977	6,118,319 [B]	676,605	207,636	249,159	401,380	56,574	57,672	7,934,157 [B]
1978	6,882,164 [A]	695,929	179,574	341,505	369,846	46,219	35,000	8,684,137 [A]

[A] Adjusted upward by 300,000 short tons. See Appendix C for discussion.

[B] Adjusted downward by 400,000 short tons. See Appendix B for discussion.

NOTE: Trade Route 29 has been 77.6, 78.5, 78.1, 76.2, 76.7 and 79.5 percent of Bay Area foreign container tonnage for 1973, 1974, 1975, 1976, 1977, and 1978 respectively.

SOURCE: Supplemental Unitized Cargo Reports, Maritime Administration, includes military cargo.

For each component, the forecasting approach was based on review and analysis of historic trade patterns and recent trends, and on evaluation of the key factors and events likely to affect future trade. Thus, it was both "past and forward looking."

TRADE ROUTE 29 FORECAST

The forecast for Trade Route 29 is supported by two analyses of containerizable cargo over the past 20 years (1959 - 1977). Containerizable, as distinct from containerized, cargo is defined to include all commodities which, by current standards, are physically and economically suitable for containerization. For forecasting, containerizable cargo is analyzed to distinguish the growth of trade independent of the historic shift of break-bulk to container. Since almost all Trade Route 29 tonnages are now containerized, the analysis provides a long-term perspective on the growth of future containerized cargo on this route.

Trade Route Time Series Analysis

The first analysis focused on imports and exports of containerizable cargo on Trade Route 29 as shown in Table 22. The time series shown date back to 1959 and have been compiled from the individual cargos that are typically moved by container.* Trend line regression equations were developed from this data that show a long and stable history of high growth on Trade Route 29.

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*Appendix B provides background on the source of data and the development of the containerizable data base.

Table 22

LINER CONTAINERIZABLE TONS[A]
ON TRADE ROUTE 29
(thousands of long tons)

Year	Imports	Exports
1959	713	740
1960	703	1,006
1961	682	1,156
1962	784	1,066
1963	835	1,394
1964	952	1,454
1965	1,036	1,343
1966	1,175	1,382
1967	1,155	1,275
1968	1,337	1,256
1969	1,558	1,695
1970	1,770	1,785
1971	1,746	1,421
1972	2,084	1,676
1973	2,168	2,630
1974	2,492	2,846
1975	2,188	2,416
1976	3,235	2,967
1977	4,043	3,370

[A]See discussion in Appendix B.

Source: TBS analysis in MSB Docket S-619.

Regression analysis calculates a straight line or curve that "fits" the historical data. The coefficient of determination, or R^2 (R-squared) of the calculation is a measure of how well the line matches the data points. The R^2 statistic ranges from .0 to 1.0 with values closer to 1.0 indicating the better fit of the line to the data points. Typically, an equation with an R^2 above .90 from a sufficiently long time series is considered a good predictor. The T-Statistic shows the significance of the explanatory variable. It is desirable to have as large (either positive or negative) a T-Statistic as possible. Generally a T-Statistic greater than 2.0 or less than -2.0 indicates a good relationship between the independent and dependent variables.

The TBS analysis of Trade Route 29 containerizable imports from 1959 to 1977 yielded an R^2 of .969 for an equation predicting annual growth of 9.8 percent. Further analysis identified two distinct phases in this growth. The first phase encompassed 1959 to 1973 and showed a growth rate of 9.3 percent with an R^2 of .977. The second phase included 1973 through 1977 and showed a much higher rate of growth of 16.26 percent but had an R^2 of only .744.* (However, when the 1975 recession year data

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*The three regression equations in the order discussed in the text are:

1959 - 1977: $\text{Imports} = 548.61e^{.0939\ (\text{Year} - 1958)}$

1959 - 1973: $\text{Imports} = 566.81e^{.089\ (\text{Year} - 1958)}$

1973 - 1977: $\text{Imports} = 1743.66e^{.1507\ (\text{Year} - 1972)}$

i.e., $\text{Trade} = Ae^{Bx}$ where A is a constant, B is the continuous rate of growth for the exponential curve fit to the data, and x is the period for which the level of trade is predicted. The coefficient B is converted to the compound annual rate of growth by computing e^B. For example, when B is .0939, $e^B = 1.098$. Computation of trade for any two consecutive years would verify this rate of growth.

was dropped, the second phase R^2 climbed to .988 and the growth rate remained at 16.26 percent.)

While there are several contributing factors to the high growth of the 1973-1977 period, one of the major factors was the advent of minilandbridge (MLB) traffic.* As shown in Table 23, inbound MLB through West Coast ports increased by nearly 500,000 tons between 1974 and 1977 for a compound annual growth rate of nearly 30 percent. The MLB tonnage represents about 32 percent of the growth in containerizable imports, shown previously in Table 22, between 1974 and 1977.

Table 23

MINILANDBRIDGE CARGO FROM FAR EAST
TO U.S. ATLANTIC AND GULF
1974-1977
(thousands of long tons)

	1974	1975	1976	1977
Atlantic				
Far East	232	202	380	545
S.E. Asia	3	5	9	16
Total Atlantic	235	207	389	561
Gulf				
Far East	187	207	274	348
S.E. Asia	2	3	8	12
Total Gulf	189	210	282	360
Total MLB	424	417	671	921

Source: TBS analysis of Census IA245 Reports, 1974-1977.

*MLB traffic includes cargos moving between the East and Gulf Coasts of the U.S. and the Far East, which move through West Coast ports and across the U.S. by rail, rather than utilizing the all-water route through the Panama Canal.

Comparison of growth rates for containerizable imports and exports on an annual or short term basis shows that higher growth in one direction is paired with lower growth in the other direction and that these pairings tend to continue to reverse themselves over time. For example, higher export growth and lower import growth in the late 1960s and early 1970s was followed by higher import and lower export growth in the mid-1970s. Since 1977, this pattern appears to have again reversed itself. Liner exports on Trade Route 29* have shown rapid growth of 27.4 percent from 1977 to 1978 and 14.3 percent from 1978 to 1979. Similarly, export tonnage exceeded imports through 1967, imports were 81,000 higher than exports in 1968, and since then the two directions have shifted back and forth several times as can be seen in Table 22. These shifts, which are in part related to currency relationships and economic cycles, suggest that imports and exports will continue to follow each other as trade grows with the Pacific Basin countries.

Over the longer term, analysis of the data in Table 22 suggests that the growth rates for imports and exports will be relatively similar. They will vary for any particular time period depending on where in the import and export cycle a given set of data points occurs. Between 1959 and 1977, the total of both containerizable imports and exports has grown at a compound annual rate of 9.5 percent. Imports have indicated a continuing rate of around 10 percent (9.8 percent from the regression analysis or at a compound annual rate of 10.1 percent) while export growth was below that rate for the 1959 - 1977 period (8.8 percent compound annual growth) but has recently exceeded that rate.

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*Recent liner export data is from the Census FT985 reports and compares with the containerizable data since nearly all liner cargo on Trade Route 29 is currently containerizable.

Far East Trade and U.S. GNP

A second analysis investigated the relationships between U.S. - Far East containerizable imports and U.S. Gross National Product (GNP). Table 24 (on next page) presents liner containerizable cargo for total U.S. - Far East trade* and U.S. GNP in 1972 dollars. By using the log values of both the containerizable tonnage and GNP variable, the relationships shown in Table 25 were developed. The form of the relationship is: ln (container imports) = A coefficient + B coefficient times ln (GNP).** Since imports and exports historically increase at about the same rate, the GNP import analysis can also be viewed as reflecting both import and export growth.

Table 25

RESULTS OF TIME PERIOD TESTS OF REGRESSIONS

Regression Period	A Coefficient	B Coefficient	R^2	T Statistic
1959-1977	-6.8872	2.1685	96.4%	26.81
1967-1977	-6.7098	2.1432	94.3	7.21
1971-1977	-5.4766	1.9696	68.5	3.28
1959-1976	-6.7602	2.1498	95.6	24.41
1959-1974	-7.1567	2.2088	97.0	26.44
1967-1974	-7.0342	2.191[illegible]	81.0	5.56

The equations in Table 25 show:

- R^2 values above .81 for all tests except 1971 - 1977, for which the R^2 was .685, and
- Significant T-statistics with very high values for the regressions beginning with 1959.

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*Total U.S. - Far East trade includes trade on Routes 29 (U.S. Pacific ports), 22 (U.S. Gulf ports), and 12 (U.S. Atlantic ports).

**ln is the symbol for the natural logarithm.

Table 24

CONTAINERIZABLE IMPORTS
U.S. - FAR EAST TRADE ROUTES 12, 22, 29
(thousands of long tons)

Year	U.S. Liner Containerizable Imports [A]	Billions of 1972 $ U.S. GNP
1959	1,702	720.5
1960	1,727	736.8
1961	1,644	755.3
1962	1,958	799.1
1963	2,121	830.7
1964	2,417	874.4
1965	2,912	925.9
1966	3,233	981.0
1967	3,199	1,007.7
1968	3,442	1,051.8
1969	3,738	1,078.8
1970	4,368	1,075.3
1971	4,422	1,107.5
1972	4,865	1,171.1
1973	4,994	1,235.0
1974	4,490	1,217.8
1975	4,150	1,202.4
1976	5,584	1,271.0
1977	6,331	1,332.7

[A] See discussion in Appendix B.

Sources:

1. U. S. Liner Containerizable: 1967 - 1977, Docket S-619, Exhibit SL-9; 1959 - 1966, Table 3, Exhibit APL-40, Docket S-417, adjusted by 2 percent. Trade Routes 12, 22, 29.
2. U.S. GNP (1972$): Data Resources, Inc., December 1978 Long Run Model, copyright DRI, used with permission.

The tests indicate a stable and significant relationship between GNP and containerizable imports from the Far East over the 1959 - 1977 period. The 1971 - 1977 period yields a less satisfactory relationship partly due to the unusually large recession in 1974 - 1975 and the consequent decline in imports. The best statistical results are achieved over the 1959 - 1974 period with an R^2 of .97 (although the statistical results for the 1959 - 1977 period are very similar). The 1959 - 1974 equation also provides a good forecast of the 1976 and 1977 values (as shown in Table 26) even though they were not used to construct the equation. The 1975 forecast was not as accurate because of the unusually large trade decline during the recession.

Table 26

U.S. - FAR EAST CONTAINERIZABLE IMPORTS
COMPARISON OF FORECASTED AND ACTUAL TONNAGES
USING THE 1959-1974 EQUATION
(thousands of short tons)

Year	Predicted Tonnage	Actual Tonnage	Percent Error
1975	4,954	4,150	19.4%
1976	5,600	5,584	0.3
1977	6,218	6,331	(1.8)

A forecast of total U.S. - Far East imports (Trade Routes 12, 22, 29) based on the 1959 - 1974 equation and the Data Resources, Inc. (DRI) Trendlong prediction of U.S. GNP is shown in Table 27. The GNP prediction reflects growth averaging 2.7 percent per year from 1977 to 1990 and 2.2 percent from 1990 to 2000; lower growth than the 3.5 percent experienced from 1959 to 1977. The forecast of Far East imports would be higher if GNP growth were forecast at historic rates.

Table 27

FORECAST OF U.S.-FAR EAST CONTAINERIZABLE IMPORTS USING GNP AND THE 1953-1974 EQUATION

(thousands of short tons)

Year	DRI Trendlong GNP[A]	Trade Routes 12,22,29 Far East Imports	-----Trade Route 29------ Imports	Share
1977	1,332.7	6,331	4,043	63.8%
1980	1,409.7	7,042	4,711	66.9
1985	1,654.0	10,023	7,206	71.9
1990	1,891.2	13,475	10,362	76.9
2000	2,352.3	21,819	18,415	84.4
2005	2,638.2	28,110	24,427	86.9
2020	NA	60,130	52,252	86.9

NOTE: Year 2020 GNP was not available from DRI, tonnage was computed by TBS using the rate of tonnage growth from 2000-2005.

[A]Copyright Data Resources, Inc., used with permission; billions of 1972 dollars.

Table 27 also shows a forecast for Trade Route 29 which includes a continuing shift of U.S. - Far East cargo to the Pacific Coast at 1 percent a year through 1995, at .5 percent through 2005, and remaining constant thereafter. This shift is indicated by the continuing growth of Trade Route 29's share of total Far East imports in the right-hand column of Table 27. In the past, Trade Route 29's share of total Far East trade has increased from around 40 percent to over 60 percent as can be seen through comparison of the data in Tables 22 and 24. Since this shift has essentially occurred over the last decade, the forecasted rates in Table 27 reflect the expectation that historical trends will continue into the future, moderating over time. The reasons behind this shift have and will continue to include the growth of minilandbridge traffic, the shifts in population and industrial expansion to the west, and the greater levels of services and sailing frequencies on the West Coast.

Over the 1977 - 1990 period, the Trade Route 29 forecast in Table 27 shows a compound annual growth rate of 7.5 percent, while the 1990 - 2000 period grows at 5.9 percent and the 2000 - 2020 period at 5.4 percent.

Bay Area Forecast

The baseline, high, and low forecasts of Bay Area Trade Route 29 containerized cargo shown in Table 28 are based on evaluation of future factors and events within the context of the historic patterns and recent trends described above. The reasoning behind the growth rates projected for each scenario is explained below.

Table 28

FORECAST OF BAY AREA TRADE ROUTE 29
CONTAINERIZED CARGO
(thousands of short tons)

	1978[A]	% Growth	1985	% Growth	1990	% Growth	2000	% Growth	2020
Baseline	3,106	9.5%	5,860	9.5%	9,225	5.5%	15,760	5.0%	41,810
High	3,106	10.5	6,250	10.5	10,300	6.0	18,445	5.0	48,940
Low	3,106	7.5	5,150	7.5	7,395	5.0	12,045	5.0	31,960

[A] Source is Supplemental Unitized Cargo Container Reports, MarAd; adjusted upward by 300,000 tons per Table 13 and Appendix B.

Baseline Forecast

The baseline forecast takes the view that the potentials for growth of trade with Pacific Basin countries are sufficiently great to justify a forecast over the next decade that reflects

a continuation of a high rate of growth similar to that experienced over the past 20 years and identified in the time series analysis above. This outlook reflects a greater propensity for trade in the U.S. (given the forecasts for lower GNP growth), the continuing shift of total U.S. trade to Pacific Basin countries, and the continuing shift of U.S. - Far East trade to the Pacific Coast. As a result, the growth of Pacific Coast trade will continue at rates that exceed the growth of total U.S. trade. The baseline forecast further assumes that this high rate of growth is unlikely to be maintained over the longer term so that beyond 1990, the forecast reflects a moderation of the growth rate to levels more similar to those supported by the analysis of the relationship between Far East trade and U.S. GNP. As shown in Table 28, the baseline forecast grows at 9.5 percent per year through 1990, at 5.5 percent from 1990 to 2000, and at 5.0 percent thereafter.

Achievement of this forecast requires the continued development of Pacific Basin trade as would be supported by:

- Continued growth of trade with Taiwan, Hong Kong, and Korea as large exporters to the U.S.;
- Expansion of trade with China which is likely to be partly containerized;
- Continued high levels of trade between U.S. and Japan with potential competition among Pacific Basin countries for U.S. trade;
- Continued high growth of micro and miniland-bridge cargo, bringing additional Gulf and Atlantic cargo through the Pacific Coast although at future rates of growth below those experienced in 1973 - 1977.

The 9.5 percent growth rate assumes the continuation of a rate of growth that was largely supported in the past by the rapid expansion of the Japanese economy and the U.S. - Japan trade

"boom," and by the advent of minilandbridge (MLB) traffic which shifted the movement of Gulf and Atlantic cargos to West Coast ports. Although trade with Japan and the growth of MLB traffic will continue to be major factors supporting large Pacific trade growth, the continuation of past high rates also assumes the continued development of trade with nations such as Taiwan, Hong Kong, Korea, and China.

While U.S. - China trade is expected to grow substantially, dramatic growth of container trade is not expected, at least not over the next ten to twenty years. The factors regarding the forecast of China trade on Trade Route 29 are summarized below:

- Cargos important in the China trade so far have generally not been consumer goods. Thus, the tonnages of containerized China trade are very small. Other cargos with higher tonnages (such as grains) are included in the forecasts for other market segments (such as the grain export forecast).

- It will be a while before China has the wealth to significantly increase demand for consumer goods. When that occurs, Japan will be a major competitor with the U.S. for China's imports. Japan is located closer to China and offers products which are very competitive with U.S. goods.

- What we do see now are exports from China of goods such as textiles which are similar to the products from Singapore and Hong Kong. While there will be growth of these exports, there will also be competition among trading partners. As a result, a high growth in U.S. trade with China is likely to mean some shift in trade among these countries.

U.S. West Coast trade with Russia was also considered. Russian trade is included in the base data for Trade Route 29 and in the forecasts. Current tonnages are very small, however, and no major increases are forecast. While there are potentials for significant growth as Russia's western area builds in production and consumption, the future is very unclear. Major reasons for uncertainty are that U.S. - Soviet trade is subject to international relations between the two countries and that Japan will be a major competitor with the U.S. as Russian trade develops with the West.

In addition to factors and events affecting Pacific Coast trade, the forecast evaluated the Bay Area's ability to participate in the forecast growth. In the baseline forecast, the Bay Area is projected to maintain its competitive position vis-a-vis other West Coast ports for Trade Route 29 cargo and as a result, the Bay Area cargo is projected to grow at the same rates as the route as a whole. Recent experience through 1979 supports this assumption since prior declines in Bay Area share of foreign container cargo which had been experienced through 1975 had stabilized through 1979. Early data for 1980, however, show a loss of share although the reasons for this shift are not yet clear and the data are too recent to indicate a permanent renewal of past trends. More discussion of share is provided for total foreign container trade in a later section of this chapter.

High Scenario

Compared to the baseline forecast, the high scenario for Trade Route 29 reflects greater growth in Pacific Basin trade. It projects a rate of growth over the 1978 - 1980 period which exceeds the high rate experienced over the past 20 years. As shown in Table 28, it assumes growth of 10.5 percent per year through 1990, 6 percent from 1990 to 2000, and 5 percent in the

2000-2020 period. This high forecast would be supported primarily by a higher Pacific Coast share of U.S. foreign trade, as could result from higher growth of trade with Far East industrialized and developing countries, particularly China, Taiwan, Hong Kong, and Korea. Like the baseline forecast, the high scenario also reflects a constant Bay Area market share of Pacific Coast trade.

The choice of the particular growth rates used for the high scenario was based on consideration of growth potentials for Pacific Basin trade and the ability of the U.S. economy to support trade growth. The 10.5 percent growth rate is seen as providing a more optimistic view of Pacific trade growth potentials than the baseline forecast, while still being within range of the growth rates achieved in the past (higher than the 20-year growth rates, but lower than rates for shorter term periods). The choice of how "high" to go also considered the GNP analysis as indicating a form of upper limitation on the growth of Pacific container trade. The growth of Pacific Coast - Far East trade must stay within the range of possibilities for total U.S. trade growth, for the share represented by U.S. - Far East trade, and for the share of the latter which moves through the Pacific Coast. Following this reasoning, the high Trade Route 29 forecast appears to be in line with current U.S. GNP forecasts and a somewhat increasing propensity to trade. It could also be viewed as taking a more optimistic view of GNP growth potentials. Within this context, it is felt that still higher growth of trade with one nation (such as China) would be offset by shifts among trading partners.

Low Scenario

The low forecast takes the view that Trade Route 29 container trade will continue to grow at rates similar to those

indicated by the GNP analysis. It projects 7.5 percent per year growth through 1990 and 5.0 percent thereafter. This reflects a forecast that says the U.S. economy will support a level of Far East trade based on past relationships between this trade and U.S. GNP and on current forecasts of future GNP. In addition, it assumes that the share of Far East trade moving through the Pacific Coast continues to increase over the next 20 years. Compared with the past, the low scenario projects lower overall rates of growth than experienced over the past 20 years primarily because of forecasts for lower future U.S. economic growth supporting less trade.

Compared to the baseline forecast, the low scenario would reflect some or all of the following:

- Lower U.S. economic growth supporting less demand for goods;
- Less rapid growth of West Coast share of U.S. foreign trade;
- Introduction of trading agreements to limit U.S. imports;
- Increase in exports of Far East products to non-U.S. markets (such as Japanese goods to European markets);
- Greater competition for U.S. trade among trading partners because of similarity of goods and economic limitations to U.S. container trade;
- Potential loss of Bay Area market share of Trade Route 29 cargo.

FORECAST OF OTHER PACIFIC ROUTES

The forecast of containerized cargo also includes the continued growth and containerization of trade on other Pacific Coast routes (South America, Europe, Indonesia, Australia, and other foreign trades excluding Trade Route 29).

Recent Trade Patterns

As shown in Table 29, many of these routes are now partly containerized and have containerized significantly since 1973. Over the 1973-1978 period, liner tonnage on these routes has grown at a compound annual rate of 3.6 percent and containerized cargo has grown from 35 percent to 56 percent of the trade. This pattern describes the aggregate behavior of several routes with different individual trade patterns. For example, trade with Indonesia (Trade Route 17) grew over 14 percent per year while trade on the South American routes (Trade Routes 24 and 25) remained relatively stable.

The historic data presented here are for a relatively short time period, since trade, particularly on some of these routes, was at low levels prior to 1973 and has only recently become more developed. A review for the 1967 to 1979 period indicated growth of liner trade on these routes of about 2.6 percent per year as compared with the 3.6 percent for the more recent period.

Bay Area Forecast

The forecasts of containerized cargo on other trade routes shown in Table 30 reflect both the continued growth of trade on these routes and the continued shift of breakbulk cargo to containers. The forecasts were developed for the aggregate pattern of the several routes, some of which will continue to experience higher growth and others which will grow at lower rates.

Baseline Forecast

The outlook for the baseline forecast is that future growth will be similar to the recent pattern of growth experienced on these routes. The forecast assumes growth of tonnages at 3.6 percent per year and the continued containerization of breakbulk

Table 29

CALIFORNIA

COMPARISON OF LINER AND CONTAINER TONNAGE

(thousands of long tons)

Trade Route	1973	1974	1975	1976	1977	1978	--1973-1978 Growth Rate-- Continuous Growth Rate[A]	Compound Annual Rate
17 Indonesia	265.6	295.1	325.4	379.4	427.2	526.3	14.3%	14.6%
% Containerized	20%	28%	43%	71%	--	70%		
24 E. South America	142.4	179.9	123.2	126.8	124.6	162.0	(1.2)	2.6
% Containerized	19%	22%	36%	43%	45%	28%		
25 W. South America	256.3	290.7	257.5	225.0	195.9	224.1	(5.5)	(2.6)
% Containerized	15%	18%	19%	29%	29%	16%		
26 Europe	1,030.8	968.6	762.9	772.8	1,234.3	1,022.7	2.02	(.16)
% Containerized	56%	64%	66%	74%	55%	68%		
27 Australia	481.7	561.2	422.8	468.7	515.6	607.6	2.9	4.75
% Containerized	15%	29%	37%	49%	48%	56%		
65 Mediterranean	222.4	234.3	232.6	213.0	313.0	321.9	7.8	7.7
% Containerized	30%	28%	32%	63%	66%	56%		
Total	2,399.2	2,529.8	2,124.4	2,185.7	2,810.6	2,864.9	3.6%	3.6%
% Containerized	35%	40.6%	45.6%	60.9%	58.7%	56.5%		

[A] Based on exponential regression of the data.

NOTE: FT985 and container tonnages are not completely compatible. Container tonnages include military cargo while FT985 does not, FT985 values also exclude in-transit cargo. Tonnages are shown for the trade routes presented in Table II-7. Other trade routes with smaller liner or container volumes including Trade Route 23 (Caribbean), Trade Route 28 (India and continent) and Trade Route 53 (South and East Africa) totaled 318,000 liner tons in 1973 and 393,000 tons in 1978 and would increase the liner compound annual growth rate to 3.7 percent. In 1978 these trade routes were only 14 percent containerized.

Source: Census FT985 report and Table 21.

Table 30

FORECAST OF BAY AREA CONTAINERIZED TRADE ON OTHER PACIFIC COAST ROUTES

South American, European, and Other Foreign Trades

FORECAST
(thousands of short tons)

	1978[A]	% Growth	1985	% Growth	1990	% Growth	2000	% Growth	2020
Baseline	777	5.8%	1,150	5.4%	1,495	4.5%	2,325	4.2%	5,255
High	777	7.9	1,325	6.5	1,815	5.2	3,010	4.8	7,720
Low	777	4.7	1,075	4.7	1,355	3.8	1,975	3.5	3,950

FORECAST ASSUMPTIONS

	GROWTH IN TRADE	PENETRATION OF CONTAINER[B] Percent of Foreign Breakbulk that Containerizes			
	Annual Rate	1985	1990	2000	2020
Baseline	3.6%	25%	40%	60%	85%
High	4.5	40	60	75	90
Low	3.0	20	35	50	75

NOTE: The above assumptions can be used to develop the forecasts as follows:

Container: 777 Tons in 1978 = 995 Tons in 1985 at 3.6% per Year

Shift from Breakbulk: 486 Tons in 1978 = 620 Tons in 1985 at 3.6% per Year
25% of 620 Tons = 155 Tons Shift to Container

Total Container in 1985 = 995 + 155 = 1,150

[A] Source is Supplemental Unitized Cargo Container Reports, MarAd.

[B] 1978 Breakbulk = 486 short tons and includes a very small amount of breakbulk cargo on Trade Route 29.

cargos (from 25 percent in 1985 to 85 percent by 2020). The resultant growth of containerized cargo represents 5.6 percent per year through 1990, moderating to 4.5 percent by 2000. Since the relevant historic trade pattern is for a fairly short time period, there is uncertainty for the forecasts 20 - 40 years out.

In developing the forecasts, the growth potentials for trade on these other routes was considered within the context of the combined pattern of the several individual routes, of total Pacific Coast foreign container trade (Trade Route 29 and all other foreign routes), and of the U.S. economic factors underlying foreign container trade. Regarding these relationships the baseline forecast assumes competition among emerging and current trading partners such that high growth on certain trade routes would be at least partially offset by lower growth on other routes. These types of shifts have and will continue to occur.

Bay Area container trade is assumed to grow at the same rate as total trade on these routes and to reflect the same shift to containerization. The reasoning behind this assumption is the same as that presented for Trade Route 29 and discussed further in the section beginning on page 70.

High and Low Scenarios

The high and low scenarios reflect high and low variations for both the growth of trade on these routes (3.0 percent to 4.5 percent) and the penetration of containerization (75 percent to 90 percent). Compared with the baseline forecast, the high scenario would be supported by a combination of higher U.S. economic growth supporting greater demand for goods and greater ability for foreign nations to purchase U.S. goods particularly by oil exporting countries and in situations where the relative value of the dollar strongly favors U.S. exports.

More rapid growth of trade would also support greater containerization.

The low scenario reflects slowed growth of trade with developing nations, supported by slower U.S. economic growth and by lesser ability of foreign nations to purchase U.S. exports, particularly due to the effects of higher energy costs. Lower growth of trade would mean less shift from breakbulk to container. A potential loss of the Bay Area's market share of trade on these routes would also support the lower scenario.

BAY AREA FOREIGN CONTAINER FORECASTS

As shown in Table 31, Bay Area imports and exports of all foreign containerized cargo are expected to increase to 10,720,000 tons by 1990 in the baseline scenario and to 18,085,000 short tons by 2000.

Table 31

SAN FRANCISCO BAY AREA
CONTAINERIZED CARGO - IMPORTS AND EXPORTS
(thousands of short tons)

	Adjusted[A] 1978	Forecast 1985	1990	2000	2000
Baseline	3,883	7,010	10,720	18,085	47,065
High	3,883	7,575	12,115	21,455	56,660
Low	3,883	6,225	8,750	14,020	35,910

[A] See Table 13.

Tables 32 and 33 summarize these forecasts in terms of the major assumptions behind them and the scenario of future events that they reflect.

Table 32

SUMMARY OF
BAY AREA TRADE ROUTE 29 CONTAINER FORECAST

	MAJOR ASSUMPTIONS	SCENARIO OF FUTURE EVENTS
Baseline Forecast	• Continuation of past, high rate of containerizable trade growth over 1978-1990 period; • Beyond 1990, a moderation of growth toward rate supported by long-term relationship between Far East trade and U.S. GNP and by current GNP forecasts; • Bay Area Trade Route 29 cargo projected to grow at same rates as total route.	• Continuing shifts of U.S. trade to Pacific Basin as Trade Route 29 grows at rates exceeding growth of total U.S. trade; • Expansion of trade with China which is likely to be partly containerized; • Continued growth of trade with Taiwan, Hong Kong, and Korea as large exporters to the U.S.; • Continued high levels of trade between U.S. and Japan with potential competition among Pacific Basin countries for U.S. trade; • Continued high growth of micro and minilandbridge cargo, bringing additional Gulf and Atlantic cargo to the Pacific; future rates of growth below those experienced 1973 - 1977; • Maintenance of Bay Area's competitive position vis-a-vis other West Coast ports for Trade Route 29 cargo.
High Forecast as Compared to Baseline Forecast	• Higher rate of growth over 1978 - 1990 period reflecting: - Growth potentials for Pacific Basin trade particularly with developing countries; and - Ability of U.S. economy to support trade growth; • Slightly higher growth rate from 1990 - 2000 as rate tends toward that supported by GNP analysis and GNP forecasts.	• Higher growth of trade with Far East industrialized and developing countries--China, Taiwan, Hong Kong, Korea, and Singapore; • High growth of trade with developing countries will be at least partially offset by shifts in trading partners. Competition arises both because of similarity of goods and economic limitations to U.S. container trade; • Higher West Coast share of U.S. foreign trade.
Low Forecast as Compared to Baseline Forecast	• Lower growth from 1978 to 2000 at rates derived from long-term trade - GNP relationship and current GNP forecasts, and including an additional 1 percent shift in U.S. Far East trade to Pacific Coast. Shift reflects projection that even under the low forecast, there will be continued growth in minilandbridge traffic and continued shift of Far East cargoes to West Coast.	• Lower U.S. economic growth supporting less demand for goods; • Introduction of trading agreements to limit U.S. imports; • Increase in exports of Far East products to non-U.S. markets (such as Japanese goods to European markets); • Less rapid growth of West Coast share of U.S. foreign trade; • Potential loss of Bay Area market share of Trade Route 29 cargo.

Table 33

SUMMARY OF
BAY AREA CONTAINER FORECAST
FOR FOREIGN TRADE ON OTHER ROUTES

	MAJOR ASSUMPTIONS	SCENARIO OF FUTURE EVENTS
Baseline Forecast	• Continuation of recent overall rate of growth of trade on these routes; • Continued shift of breakbulk cargo to containers; • Bay Area container cargo on these routes projected to grow similarly to total.	• Continued growth and containerization of South American, European, Australian, Indonesian, Indian, and other Pacific trades; • Competition among emerging and current trading partners such that high growth with developing countries would be at least partially offset by shifts in trading partners; • Maintenance of Bay Area's competitive position vis-a-vis other West Coast ports for trade on these routes.
High Forecast as Compared with Baseline Forecast	• Higher rate of growth of trade; • Greater market penetration of containerization.	• Higher U.S. economic growth supporting greater demand for goods; • Higher growth of trade primarily on routes with developing countries; • Potentially, greater ability for foreign nations to purchase U.S. goods, particularly by oil exporting countries; • More rapid growth of these trades supporting greater containerization.
Low Forecast as Compared with Baseline Forecast	• Lower rate of growth of trade; • Less containerization.	• Slowed growth of trade with developing nations due to high cost of energy and slow growth of U.S. economy; • Lower growth of trade meaning less shift from breakbulk to container; • Potential loss of Bay Area market share of trade on these routes.

Relationship of Trade Routes

Although separate container forecasts were prepared for Trade Route 29 and for all other Pacific Coast foreign trade routes, they should not be viewed as totally independent of each other. U.S. economic factors underlying foreign container trade are common to both forecasts. The U.S. economy can support a certain level of trade and as the developing countries on Trade Route 29 and elsewhere (China, India, Indonesia and other trading partners) begin to enter that trade, they will compete with Japan, Hong Kong, Korea, Taiwan, and Singapore--the current major trading partners. In part, the impact of growth in the developing countries will be to shift trading partners and the extent of the competition among developed and developing nations may limit the impact of the growth of the developing countries. Thus, high growth of trade with less developed countries would provide "replacement" trade for a slower growth with the more industrialized nations. Because of these shifts, the monitoring of future trade should include review of total foreign container trade as well as data for Trade Route 29 and the other foreign routes.

Bay Area Share of Foreign Trade

As explained previously, the baseline and high scenario forecasts for Trade Route 29 and other routes assume that the Bay Area will maintain its competitive position vis-a-vis other West Coast ports for foreign containerized cargo. Recent experience through 1979 (see Table 18) supports this assumption since prior declines in Bay Area share of foreign container cargo which were experienced through 1975 had stabilized through 1979. The high export growth during this period also supported the assumption of a stable future Bay Area share. Strong export growth is expected for the future and the Bay Area's ability

to compete has been strongest for exports. While there will continue to be competition from the ports to the north and south, there are no strong economic arguments against the Bay Area's ability to maintain its share.

Early 1980 data for total containerized cargo, however, show a loss of share. Data for the various components of the trade are not yet available to analyze the reasons for this decline. For example, it will be useful to separately identify the growth pattern for domestic and foreign container trade and for imports and exports. It is also uncertain whether the decline in share is a possible renewal of past trends, a one-time shift, or a short-term fluctuation.

If, over time, the share continues to show a decline, future containerized cargo would tend toward the low scenario forecast. For example, based on the extreme comparison of the baseline forecast for Pacific Coast foreign container cargo and the low forecast for San Francisco Bay, the low scenario in Table 31 would represent a 1990 Bay Area share of 24 - 25 percent. By 2000, the low scenario equates to a 23 percent share. This can be compared to the baseline forecast which maintains a constant Bay Area share of Pacific Coast foreign container trade of around 30 percent.

BAY AREA DOMESTIC CONTAINER FORECAST

Containerized domestic shipments and receipts shown in Table 34 are forecast to grow modestly from present levels in the baseline scenario. The recent declining trend has been due largely to the fall-off in Atlantic and Puerto Rican trade which is now at very low levels and cannot continue to decline at historic rates. Bay Area Hawaiian trade has also experienced some decline, but this pattern is expected to stabilize. Though some continued growth is expected in the Hawaiian trades, the combination of substitutions of imports for domestic

products, of possible moderate overall growth of the Hawaiian economy, and of the continued competition from other Pacific Coast ports is expected to keep growth at moderate levels. The baseline domestic container forecast projects growth at 1.5 percent per year to 1990 and 1.25 percent thereafter. This is approximately half the rate of forecasted U.S. GNP growth.

Table 34

SAN FRANCISCO BAY AREA
CONTAINERIZED CARGO
DOMESTIC SHIPMENTS AND RECEIPTS
(thousands of short tons)

	Actual		Forecast						
	1978	% Growth	1985	% Growth	1990	% Growth	2000	% Growth	2020
Baseline	1,126	1.5%	1,250	1.5%	1,345	1.25%	1,525	1.25%	1,955
High	1,126	3.0	1,385	3.0	1,605	2.5	2,055	2.5	3,370
Low	1,126	0.0	1,126	0.0	1,126	0.0	1,126	0.0	1,126

In the high scenario, domestic container trade is projected to grow at about the rate of overall U.S. GNP growth (3.0 percent through 1990, then at 2.5 percent). This rate is similar to the historic growth of Pacific Coast - Hawaiian trade over the past 20 years and higher than the historic growth of Bay Area - Hawaiian trade. Compared with the baseline forecast, this scenario assumes higher growth of Bay Area - Hawaiian trade as would be supported by higher Pacific Coast - Hawaiian trade growth and by maintenance of the Bay Area's current share of this trade. The high scenario also includes the possibility of future growth of intercoastal trade. It does not assume significant growth of the Bay Area's share of Atlantic, Trust Territories, and Puerto Rican trades.

For the low scenario, Bay Area domestic container trade is projected at current levels. Compared with the baseline, this assumes a combination of lower Hawaiian trade growth and a continuation of the shift in trade from the Bay Area to other West Coast ports.

A summary of the major assumptions and future events affecting the domestic container forecast is presented in Table 35.

Table 35

BAY AREA DOMESTIC CONTAINER FORECAST

	MAJOR ASSUMPTIONS	SCENARIO OF FUTURE EVENTS
Baseline Forecast	• Moderate growth of Bay Area domestic trade estimated at half the rate of forecasted U.S. GNP growth; • Growth rate reflects about half growth rate for total Hawaiian trade over past 20 years.	• Recent decline in Bay Area Hawaiian trade stabilizes; • Future growth in Hawaiian trade is somewhat offset by a combination of substitutions of imports for domestic products and continued competition from other Pacific Coast ports; • Atlantic, Trust Territories, and Puerto Rican trades remain at present low levels.
High Forecast as Compared with Baseline Forecast	• Bay Area domestic container trade is projected to grow at about the rate of overall U.S. GNP growth.	• Higher growth for Bay Area Hawaiian trade, at a rate similar to historic Hawaiian trade in total; • Bay Area maintains its competitive position for Hawaiian trade vis-a-vis other Pacific Coast ports; • Possible future growth of intercoastal trade.
Low Forecast as Compared with Baseline Forecast	• Bay Area domestic container trade is projected to remain stable at present levels.	• Future growth in Hawaiian trade is at least partially offset by the substitution of imports for domestic goods; • Continuation of shift of growth in trade to LA/Long Beach

III. BREAKBULK GENERAL CARGO

Between 1973 and 1978, Breakbulk General Cargo has declined from 12.6 percent to 5.1 percent of Bay Area dry cargo. The majority of breakbulk cargo has been foreign imports and exports with only low levels of domestic trade. Table 36 presents recent cargo volumes by direction.

Table 36

SAN FRANCISCO BAY AREA
BREAKBULK GENERAL CARGO
(short tons)

Year	Imports	Exports	Receipts	Shipments
1973	787,126	406,180	44,099	10,009
1974	533,399	420,777	45,226	0
1975	364,595	122,229	20,568	0
1976	287,866	248,159	0	0
1977	283,441	197,857	0	0
1978	352,471	133,259	0	0

Source: Waterborne Commerce of the United States, Part 4
U.S. Army Corps of Engineers, 1973-1978, see Table 1, Chapter I, and Appendix A.

Imports to the Bay Area have declined at a compound annual rate of 14.8 percent between 1973 and 1978. Exports have declined at 20.0 percent per year over the same period.

FORECAST

The forecast of breakbulk cargo considers the future for breakbulk trade on the developing trade routes serving the Bay Area. These include the South America, European, Indonesian, Australian, Indian, and other Pacific trades. As was shown

in Table 29 in Chapter II, these routes have a mix of container and breakbulk general cargos. Many of these routes already have significant container traffic and in the past containerization has proceeded rapidly once begun.

Since the level of breakbulk trade depends largely on the introduction of containerization, the forecast of breakbulk cargo involves the same analyses as does the forecast of containerized cargos on these routes. As discussed in Chapter II (see Table 29), the growth of breakbulk cargo must be forecast as must the shift of breakbulk to containers. The share that remains as breakbulk provides the breakbulk general cargo forecast shown in Table 37.

Table 37

SAN FRANCISCO BAY AREA
BREAKBULK GENERAL CARGO-IMPORTS AND EXPORTS
(thousands of short tons)

	Actual	Forecast			
	1978	1985	1990	2000	2020
High	486	480	450	445	420
Baseline	486	465	440	425	320
Low	486	395	330	320	310

For the baseline forecast, liner cargo is projected to grow at 3.6 percent annually, the rate of growth of liner cargo on the Pacific trade routes other than Trade Route 29 over the 1973-1978 period. The shift of breakbulk cargo to containers is also projected to continue. The result of these two trends is a forecast, for the baseline scenario, of a slowly declining level of breakbulk trade as the shift to container (25 percent in 1985 to 85 percent in 2020) is forecast to overcome the growth

of breakbulk trade. Regarding Trade Route 29, significant volumes of breakbulk general cargo are not expected from the developing trades on this route such as trade with China.

The high and low scenarios reflect variations in both the rate of growth of trade and the share remaining as breakbulk. The low breakbulk forecast occurs with the higher rate of growth of these trades since more growth also will mean greater containerization and less remaining breakbulk. Similarly, the high breakbulk scenario occurs with the lower growth of trade since there is less containerization. In both scenarios, however, breakbulk cargo is forecast to decline from present levels. The amount of decline would range from a slight change to a decline of 30-40 percent. Table 38 presents the growth rates and share of cargo remaining as breakbulk for each scenario.

Table 38

SAN FRANCISCO BAY AREA
BREAKBULK GENERAL CARGO FORECAST
Growth Rates and Ratios

	Annual Growth Rate	Remaining Breakbulk				
		1978	1985	1990	2000	2020
Baseline	3.6%	100%	75%	60%	40%	15%
High	3.0	100	80	65	50	25
Low	4.5	100	60	40	25	10

Table 39 provides a summary of key factors supporting the breakbulk forecast.

Table 39

SUMMARY OF
BAY AREA BREAKBULK CARGO FORECAST

	MAJOR ASSUMPTIONS	SCENARIO OF FUTURE EVENTS
Baseline Forecast	• Continuation of recent rate of growth of trade on these routes; • Continued shift of breakbulk cargo to containers; • Bay Area maintains its share of Pacific Coast trade.	• Continued decline of breakbulk trade as the shift to containerization continues on South American, Indonesian, Indian, and other Pacific trade routes with developing countries; • Shift to container overcomes projected growth of trade; the result being a slowly declining level of breakbulk trade in the Bay Area; • China trade does not generate significant volumes of breakbulk general cargo.
High Forecast as Compared with Baseline Forecast	• Slower market penetration of containerization. • Lower rate of growth of trade.	• Little change from present levels of breakbulk cargo; • Shift to container just overcomes growth of trade; • Lower overall growth of trade with developing countries.
Low Forecast as Compared with Baseline Forecast	• Faster market penetration of containerization. • Higher rate of growth of trade.	• Greater overall growth of trade with developing countries allowing for more rapid deployment of container ships; • Significant decline of breakbulk trade as shift to container more than overcomes growth of trade; • Most trade on these routes becomes containerized by mid-1990's.

IV. AUTOMOBILES AND MOTOR VEHICLES
COMMODITY 3711

Over the 1969 to 1978 period automobiles and motor vehicles have grown from 2.3 percent of the San Francisco Bay dry cargo trade to 4.3 percent. The dominant portion of the trade has been foreign imports with domestic shipments, primarily to Hawaii, nearly equaling foreign exports in most years. Domestic receipts have remained relatively constant at a low level. Table 40 shows recent cargo volumes by direction.

Table 40

SAN FRANCISCO BAY AREA
AUTOMOBILES AND MOTOR VEHICLES
(short tons)

Year	Imports	Exports	Receipts	Shipments
1969	108,419	49,757	4,518	30,222
1970	125,299	44,579	11,586	33,040
1971	152,757	27,450	3,900	27,547
1972	151,035	24,597	10,587	35,840
1973	158,773	39,816	7,319	44,507
1974	172,788	71,872	10,619	35,136
1975	143,802	52,747	10,637	48,717
1976	191,147	40,061	8,619	50,180
1977	234,359	40,338	9,084	59,327
1978	278,239	62,140	8,508	55,171

Source: Waterborne Commerce of the United States, Part 4, U.S. Army Corps of Engineers, 1969-1978.

FOREIGN IMPORTS

Imports to the Bay Area, shown in Table 41, have grown at an annual rate* in excess of 8.8 percent during 1969 - 1978.

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*The growth rates referred to in Chapters IV through XII are continuous annual rates computed from an exponential regression of all ten data points to reduce the influence of the first and last years as with compound annual rates. Chapters II and III use compound annual rates for recent trends because generally more than five years of compiled data would be needed for a regression analysis to be meaningful, particularly when the period includes the influence of a major economic cycle such as the 1974-1975 recession.

Imports continued to grow in 1979, but declined in 1980 primarily because of the recession. Though growth has been substantial, the Bay Area has not maintained its historical coastal share. Bay Area share has fallen from 27.4 percent of the Pacific Coast in 1969 to 16.4 percent in 1978. Over the same period, the ports of the Pacific Northwest have grown from 17.8 percent to 35.7 percent and Los Angeles/ Long Beach has declined from 54.7 percent to 42.1 percent. Though the Bay Area has not maintained its market share of auto imports, the growth on the Pacific Coast as a whole has been rapid enough to provide significant tonnage increases. As shown in Table 41, the Pacific Coast has grown at about 16.0 percent annually over the 1969 to 1978 period.

Table 41

PACIFIC COAST PORTS
AUTOMOBILE AND MOTOR VEHICLE IMPORTS
(short tons)

Year	San Francisco Bay	Los Angeles/ Long Beach	Portland	Seattle	Vancouver	Pacific Coast
1969	108,419	216,052	40,998	28,627	543	395,256
1970	125,299	262,422	41,232	30,364	920	461,303
1971	152,757	227,304	58,264	52,911	2,555	504,964
1972	151,035	300,581	43,927	77,103	6,535	586,748
1973	158,773	347,691	40,135	92,261	22,011	664,794
1974	172,788	427,319	70,596	174,711	24,403	870,819
1975	143,302	318,090	65,470	136,793	17,820	685,346
1976	191,147	421,452	127,657	226,113	25,173	1,002,423
1977	234,359	486,869	214,000	263,689	40,359	1,272,328
1978	273,239	716,905	255,487	309,425	43,379	1,701,519

Source: Waterborne Commerce of the United States, Part 4, U.S. Army Corps of Engineers, 1969-1978.

As shown in Table 42, this growth has increased Pacific Coast share of all U.S. auto imports from 29.4 percent to 44.0 percent over the same period. The growth has been due to the dramatic rise of Japanese manufacturers as the major source of U.S. imports.

Table 42

PACIFIC COAST SHARE
AUTOMOBILES IMPORTS
(short tons)

Year	Pacific Coast	Total U.S.	Percent of Total
1969	395,256	1,345,236	29.4
1970	461,303	1,609,262	28.7
1971	504,964	2,033,981	24.8
1972	586,748	2,172,150	27.0
1973	664,794	2,216,804	30.0
1974	870,919	2,653,025	32.8
1975	685,846	2,039,579	33.6
1976	1,002,423	2,637,104	38.0
1977	1,272,328	2,970,570	42.8
1978	1,701,613	3,869,382	44.0

Source: Waterborne Commerce of the United States, Part 4
U.S. Army Corps of Engineers, 1969-1978

Table 43 shows that in 1979, Japanese imports dominated the major Pacific Coast ports.

Table 43

1979 AUTOMOBILE IMPORTS
(short tons)

Country*	San Francisco Bay	Los Angeles/Long Beach	Portland	Vancouver	Seattle
Japan	153,973	645,156	249,957	21,702	139,934
West Germany	11,292	63,426	4,664	11,460	0
Netherlands	17	44	11	0	0
Belgium	7,051	13,622	4,036	0	0
England	5,709	9,563	6	0	0
Italy	0	19,349	3,543	0	1
France	0	685	780	0	0
Sweden	2,845	12,834	6,056	266	0

*Country of shipment, not manufacture.

Source: Census SA305/705.

And Table 44 shows that the Japanese imports have made similar gains throughout the U.S.

Table 44

IMPORT REGISTRATIONS IN U.S.
(thousands of units)

	1975	1976	1977	1978	1979
Toyota	293.9	346.9	493.0	441.8	507.8
Datsun	253.2	270.1	388.4	338.1	472.3
Honda	102.4	150.9	223.6	274.9	353.3
VW	267.7	201.6	260.7	216.7	125.1[A]
Mazda	65.4	35.4	50.6	75.3	156.5
Subaru	41.6	48.9	80.8	103.3	127.9
Fiat	100.5	61.5	63.5	60.4	58.9
Volvo	60.3	43.9	46.8	50.9	56.0
Total	1,577.0	1,493.0	2,071.1	2,000.5	2,037.9

[A] excludes domestic production of 149,000.

Source: Automotive News, 1979 Yearbook.

OTHER MOVEMENTS

Domestic shipments are usually destined for Hawaii and have grown at an annual rate of 8.4 percent. Foreign exports have been stable over the 1969-1978 period. Foreign exports are primarily destined for South and Central American countries.

KEY FACTORS

The most important factor influencing San Francisco Bay auto movements has been the growth of Japanese imports The continuation of these high levels of imports will depend on both the U.S. manufacturers' success in producing competitive models and on the extent of production in the U.S. by overseas manufacturers. A second important factor has been the decline in Bay Area share of Pacific Coast imports as the Pacific Northwest has developed auto handling facilities which have attracted much of the growth of imports.

FORECAST

Imports

The baseline forecast of auto imports reflects continuing growth of Japanese imports over the next ten years, with moderating growth over the longer term. Specifically, for the next decade, it reflects:

- Steady growth of overall U.S. auto demand at a fairly low level of 2 percent per year after a slow recovery from the 1980 recession. The 2 percent rate is in line with recent industry forecasts and with the forecasts of the U.S. Department of Commerce.*

- Stabilizing import market share at previously sustained levels of 20 - 22 percent and below current high levels (approaching 30 percent in 1980).** A stabilizing import market share assumes that U.S. domestic production picks up from recent low levels, that foreign manufacturers develop production facilities in the U.S., and that import controls or voluntary restraints moderate Japanese participation in the U.S. auto market.

- Continued growth of Pacific Coast share of import market from 44 percent in 1978 (see Table 42) to 56 percent by 1990 reflecting the continuing growth of Japanese auto imports and an increase in their share of total U.S. auto imports.

- Maintenance of the Bay Area's 1978 share of Pacific Coast import trade. With a stabilizing import market, the Bay Area ports are assumed to recover from their recent decline in share and to grow at the same rate as the Pacific Coast.

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*See, for example, Journal of Commerce, October 20, 1980, page 16, and Wall Street Journal, December 26, 1980.

**Import market share can be monitored by U.S. Department of Commerce data and by the R. L. Polk Monthly Newsletter of auto industry statistics.

The result, shown in Table 45, is a baseline forecast for Bay Area auto imports growing at about 4 percent per year through 1990. Beyond that time, Pacific Coast imports are expected to keep pace with the growth in total market demand of 2 percent annually.

Table 45

SAN FRANCISCO BAY AREA
AUTOMOBILE IMPORTS
(thousands of short tons)

	Actual 1978	% Growth	Forecast 1985	% Growth	1990	% Growth	2000	% Growth	2020
Baseline	278	4.0%	365	4.0%	445	2.0%	540	2.0%	800
High	278	5.0	390	5.0	500	2.0	610	2.0	905
Low	278	2.0	320	1.0	335	1.0	370	1.0	450

The high and low forecasts primarily reflect variations in the import market share based on different scenarios regarding the success of U.S. manufacturers in producing competitive models, the extent of U.S. production by foreign manufacturers, and the effect of actual or threatened import controls. These scenarios are summarized in Table 46. The low forecast could also reflect lower growth of overall U.S. auto demand and possibly, a decline in the Bay Area's share of Pacific Coast auto imports.

Table 46

SUMMARY OF
BAY AREA CARGO FORECAST FOR
AUTOMOBILES AND MOTOR VEHICLES

	MAJOR ASSUMPTIONS	SCENARIO OF FUTURE EVENTS
Baseline Forecast for IMPORTS	• Steady growth of overall U.S. auto demand at 2% per year in line with industry estimates; • Stabilizing import market share at previously sustained levels of 20-22%, below current high levels (approaching 30% in 1980); • Continued growth of Pacific Coast share of import market from 44% in 1978 to 56% by 1990. Beyond 1990, Pacific Coast imports expected to keep pace with overall market growth of 2%; • Bay Area maintains its present share of Pacific Coast import trade.	• Slow recovery of U.S. auto demand from 1980 recession; • U.S domestic production picks up from present low levels and foreign manufacturers develop some production facilities in the U.S.; • Import controls or voluntary restraints moderate Japanese participation in U.S. auto market; • Continued dominance of import market by Japanese. Continuing growth of Japanese imports over next ten years with moderating growth over longer term; • With stabilizing import market, Bay Area ports recover from recent decline in share due to development of auto handling facilities in Pacific Northwest.
High IMPORT Forecast as Compared with Baseline Forecast	• Higher overall growth of Bay Area auto imports over 1978 to 1990 period at rate exceeding growth under Baseline forecast.	• U.S. manufacturers are less successful in producing models that are competitive with imports; • Less U.S. production by foreign manufacturers; • Less effect by threatened import controls.
Low IMPORT Forecast as Compared with Baseline Forecast	• Lower overall growth of Bay Area auto imports at rate below growth under Baseline forecast.	• U.S. manufacturers are more successful in producing competitive models; • More U.S. production by foreign manufacturers; • Possibly, lower growth of overall U.S. auto demand; • Possibly, greater import controls; • Possibly, decline in Bay Area share of Pacific Coast import trade
Forecast for EXPORTS	• Continuation of trade at present levels.	• Trend toward increase in foreign exports as U.S. manufacturers enter new foreign markets to be offset by overseas production of U.S. autos for foreign sales.
Forecast of DOMESTIC TRADE	• Continuation of trade at present levels.	• Increases in shipments of autos to Hawaii to be limited by increased competition from both Japanese producers and other Pacific Coast ports.

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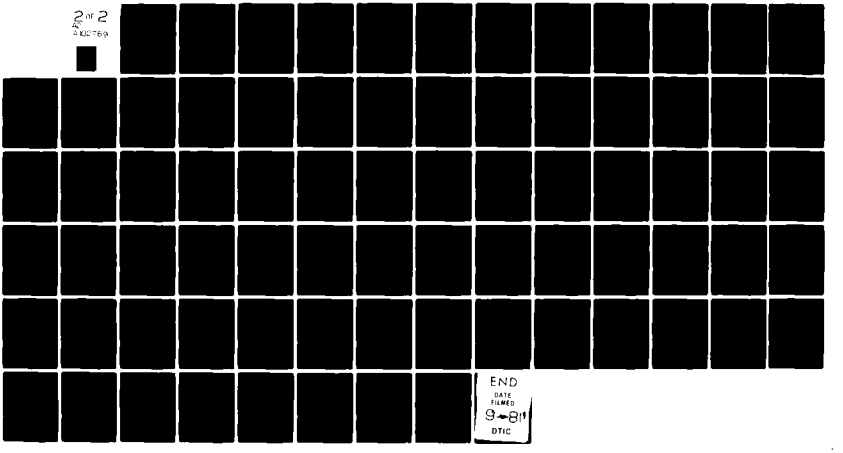

Other Movements

Domestic shipments and receipts and foreign exports of autos, as shown in Table 47, are expected to continue at present levels. There may be some trend toward an increase in foreign exports as U.S. manufacturers enter new foreign markets, but U.S. producers will probably continue to produce autos for foreign sales in overseas plants. Similarly, shipments of autos to Hawaii could grow slightly, but competition from both Japanese producers and other Pacific Coast ports will tend to limit that growth.

Table 47

SAN FRANCISCO BAY AREA AUTOMOBILES
FOREIGN EXPORTS, DOMESTIC SHIPMENTS AND RECEIPTS
(thousands of short tons)

	Actual	Forecast			
	1978	1985	1990	2000	2020
EXPORTS					
Baseline, High & Low	62	62	62	62	62
SHIPMENTS AND RECEIPTS					
Baseline, High & Low	64	64	64	64	64

V. IRON AND STEEL PRODUCTS
COMMODITIES 3314, 3315, 3316, 3317, 3318, 3319

Iron and steel products have declined from 9.2 percent to 8.7 percent of San Francisco Bay dry cargo between 1969 and 1978. The dominant portion of the trade has been foreign imports while domestic receipts have fallen from significant to very low levels. Foreign exports and domestic shipments have been relatively constant at low levels. Table 48 presents cargo volumes for the Bay Area for 1969-1978.

Table 48

SAN FRANCISCO BAY AREA
IRON AND STEEL PRODUCTS
Short Tons

Year	Imports	Exports	Receipts	Shipments
1969	440,121	97,913	203,904	44,325
1970	427,512	108,513	187,367	33,797
1971	462,658	94,526	151,380	25,478
1972	628,923	55,900	165,906	33,849
1973	512,666	76,800	220,045	47,830
1974	681,475	123,537	114,161	44,425
1975	534,192	165,219	24,108	40,460
1976	489,860	93,088	5,157	34,144
1977	557,121	60,945	2,046	34,033
1978	714,323	68,739	212	34,148

Source: Waterborne Commerce of the United States, Part 4, U.S. Army Corps of Engineers, 1969-1978.

DOMESTIC RECEIPTS

The most dramatic change in iron and steel movements has been the decline of domestic receipts. The decline reflects the termination of Bethlehem Steel's intercoastal service due partly to the closing of its steel plant near San Francisco. Prior to 1976, Calmar Steamship, a Bethlehem Steel subsidiary, operated six breakbulk vessels carrying steel products westbound and other general cargo eastbound. With suspension of this

service, Richmond receipts of iron and steel, shown in Table 49, have fallen from the 1973 level of 215,482 tons to zero. Other Pacific Coast ports, also shown in Table 49, have been similarly affected.

Table 49

IRON AND STEEL RECEIPTS
PACIFIC PORTS
Short Tons

Year	Long Beach	Richmond	Seattle	Total
1969	137,030	202,332	16,436	355,798
1970	134,351	187,087	15,160	336,598
1971	73,124	151,436	9,091	233,651
1972	75,727	163,810	5,179	244,716
1973	97,134	215,482	4,774	317,390
1974	93,052	107,956	6,031	207,039
1975	3,856	18,325	2	22,183
1976	2,529	1,200	23	3,752
1977	1,260	--	820	2,080

Source: Waterborne Commerce of the United States, Part 4, U.S. Army Corps of Engineers, 1969-1977.

FOREIGN IMPORTS

Foreign imports to San Francisco Bay have shown a changing pattern of growth with increases at an annual rate of 12.2 percent between 1969 and 1972 followed by a significant decline in 1973, sharp growth due to domestic steel shortages in 1974, and a fall off in 1975-1976 because of the recession. 1977 and 1978 levels reflect significant growth back to and beyond the 1972 levels while 1979 has shown a decline due to the recession and the impact of trigger prices.

As shown in Table 50, the Bay Area has maintained its share of imports at major Pacific Coast ports beginning with 17.2 percent in 1969 and ending with 16.7 percent in 1978.

Table 50

MAJOR PACIFIC COAST PORTS
IRON AND STEEL PRODUCT IMPORTS
Short Tons

Year	San Francisco Bay	Los Angeles/ Long Beach	Portland	Seattle	Tacoma	Total
1969	440,121	1,565,903	332,671	194,745	18,012	2,551,452
1970	427,512	1,454,552	286,687	190,681	90,754	2,450,186
1971	462,658	1,560,755	365,947	178,623	13,151	2,581,134
1972	628,923	1,936,544	447,736	195,842	42,823	3,251,868
1973	512,666	1,636,546	363,109	193,844	29,470	2,735,635
1974	681,475	2,513,614	664,372	292,412	19,163	4,171,036
1975	534,192	1,202,951	308,124	237,899	13,451	2,296,617
1976	489,860	1,743,657	340,086	187,667	34,290	2,795,560
1977	557,121	1,917,343	478,942	214,837	30,995	3,199,238
1978	714,323	2,622,806	608,624	286,679	34,863	4,267,295

Source: Waterborne Commerce of the United States, Part 4, U.S. Army Corps of Engineers, 1969-1978.

Over the same period, imports for Pacific Coast ports, as shown in Table 51, have grown slightly more rapidly than imports for the U.S. as a whole.

Table 51

PACIFIC COAST IMPORTS
SHARE OF TOTAL U.S. IMPORTS [A]
(thousands of net tons)

Year	Total U.S. Imports	Pacific Coast Imports	Percent of Total U.S.
1970	13,364	2,402	18.0%
1971	18,304	2,686	14.7
1972	17,681	3,305	18.7
1973	15,150	2,811	18.6
1974	15,970	4,095	25.6
1975	12,012	2,306	19.2
1976	14,285	2,859	20.0
1977	19,307	3,311	17.1
1978	21,135	4,320	20.4
1979	17,518	3,530	20.2

[A] Statistics are for steel mill products.

Source: American Iron & Steel Institute, Statistical Summaries, 1970-1979.

OTHER MOVEMENTS

Domestic shipments of iron and steel products have been primarily destined for Alaska and Hawaii and show no particular trend. Foreign exports have been primarily to South and Central America and also have shown no particular trend.

KEY FACTORS

The most important factor affecting iron and steel products has been the growth of foreign imports. As Table 52 shows, there has been greater relative demand for imports in the Western market* than in the U.S. as a whole. This growth has occurred despite considerable capacity in the Western states, some of it recently built. Another factor is the poor financial performance of the domestic steel industry in recent years. This makes it unlikely that the U.S. industry will be able to afford expanded capacity until the late 1980s or early 1990s.

FORECAST

Imports

Steady growth is forecast for Bay Area iron and steel imports. The forecast is based on a recovery of demand by 1982 from the recent decline due to the recession and the impact of trigger prices, and on continued moderate growth beyond 1982 in demand for imports in the U.S. Western steel market. The inability of U.S. producers to expand steel capacity due to the poor financial performance of the domestic steel industry in recent years, will encourage imports through the 1980s. Even into the 1990s, favorable transportation economics will allow Western market imports to maintain their market share.

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*Western market, as defined in the Kaiser Steel Annual Report, includes Arizona, California, Idaho, Nevada, Oregon, Utah, and Washington.

Table 52

TOTAL U.S. AND WESTERN STEEL MARKETS

1970-1979

(000) Net Tons

Year	Total U.S. Apparent Consumption	Total U.S. Imports	Imports as % of Total U.S. Apparent Consumption	Western Market Apparent Consumption	Western Market Imports	Imports as % of Western Market Apparent Consumption
1970	97,100	13,364	13.8	8,728	2,402	27.5
1971	102,515	18,304	17.9	8,575	2,686	31.3
1972	106,613	17,681	16.6	9,030	3,305	36.6
1973	122,528	15,150	12.4	9,985	2,811	28.2
1974	119,609	15,970	13.4	11,021	4,095	37.2
1975	89,016	12,012	13.5	7,412	2,326	31.4
1976	101,078	14,285	14.1	7,982	2,859	35.8
1977	108,451	19,307	17.8	8,648	3,311	38.3
1978	116,648	21,135	18.1	9,900	4,320	43.6
1979	114,962	17,518	15.2	9,150	3,530	38.6

Source: American Institute of Iron & Steel, Statistical Summaries 1970-1979; and 1979 Kaiser Steel Annual Report. Western market includes Arizona, California, Idaho, Nevada, Oregon, Utah, and Washington.

The iron and steel products forecasts are based on a recovery by 1982 of the Western steel market to the 1979 levels shown in Table 53. The 1979 levels shown are adjusted to account for the 1978 inventory buildup in anticipation of trigger price regulations (see Tables 52 and 53).

Table 53

WESTERN STEEL MARKET
(thousands of net tons)[A]

Year	Apparent Demand	Foreign Imports[D]
1976	7,982	2,859
1977	8,648	3,311
1978[B]	9,200	3,614
1979[C]	9,856	4,236

[A] Net tons compare closely with short tons but allow for loss of steel in some processes such as rolling and finishing.
[B] Receipts were 9,906 but 706 was attributed to inventory buildup in anticipation of trigger price regulations.
[C] Includes 706 of inventory reduction.
[D] Assumes all growth made up by imports.

Source: Kaiser/Steel Annual Report, TBS analysis of demand.

After 1982, the baseline forecast projects growth of the Western steel market at 2 percent per year as shown in Table 54. This rate is in line with industry estimates of 1 to 2 percent for demand nationally and with steel industry analyses performed by TBS. It is similar to the growth of U.S. demand during the 1970s and somewhat above Western market growth over this period, although Western market growth has been higher since the mid-1970s.

Table 34

SAN FRANCISCO BAY AREA
WESTERN STEEL MARKET FORECASTS

Year	Demand	Imports
---------- Baseline Scenario ----------		
1985	10,460	4,840
1990	11,550	5,930
2000	14,080	7,195
2020	20,920	10,615
----------High Scenario----------		
1985	10,460	5,230
1990	11,550	6,930
2000	14,080	8,195
2020	20,920	11,615
----------Low Scenario----------		
1985	10,155	4,535
1990	10,675	5,055
2000	11,790	5,610
2020	14,385	6,910

Through 1990, imports are projected to capture all of the growth of the Western market, increasing the import market share from 43 percent (1979/82 levels) to 52 percent (1990). Beyond 1990, domestic capacity is expected to meet half of the market growth. This reflects a continuing but moderating rate of growth of import market share through 1990 as domestic production picks up and as import participation in U.S. markets is moderated by import controls or voluntary restraints.

Compared with the baseline forecast, the high scenario projects greater penetration of imports so as to capture market growth and displace some domestic production. The import market share is projected to grow to 50 percent of the Western market by 1985 and to 60 percent by 1990. Like the baseline forecast, overall market growth is projected at 2 percent per year, and beyond 1990, domestic steel is projected to make up half of market growth.

The low scenario projects lower overall growth in Western market demand at 1 percent per year. Assuming that imports capture all of the growth through 1990, import market share increases from 43 percent to 47 percent by 1990. Beyond 1990, imports are assumed to capture half the growth, as in the other scenarios.

Bay area iron and steel imports are forecast as shown on Table 55 and described in Table 56. In all scenarios, the Bay Area is projected to maintain its current 17 percent share of Pacific Coast imports, which has been stable over the past ten years.

Table 55

SAN FRANCISCO BAY AREA
IRON AND STEEL PRODUCT IMPORTS

(thousands of short tons)

	1979/1982 [A]	Forecast [B] 1985	1990	2000	2020
High	720	890	1,180	1,395	1,975
Baseline	720	820	1,010	1,225	1,305
Low	720	770	860	955	1,175

[A] 17 percent of Pacific Coast adjusted imports for 1979 in Table 53.

[B] Bay Area forecasts represent 17 percent of Pacific Coast imports forecast in Table 54.

Table 56

SUMMARY OF
BAY AREA CARGO FORECAST FOR
IRON AND STEEL PRODUCTS

	MAJOR ASSUMPTIONS	SCENARIO OF FUTURE EVENTS
Baseline Forecast for IMPORTS	• Growth of Western steel market at 2% per year in line with industry forecasts (Western market includes Arizona, California, Idaho, Nevada, Oregon, Utah, and Washington); • Through 1990, imports capture all growth of Western steel market, increasing import market share from 43 to 52%. Beyond 1990, domestic capacity is expected to meet half of Western market growth; • Bay Area will maintain its current 17% share of Pacific Coast imports which has been stable over past 10 years.	• Recovery of demand in early 1980's from recent decline due to recession and impact of trigger prices. Continued growth thereafter for imports in U.S. Western steel market; • Inability of U.S. producers to expand steel capacity due to poor financial performance of domestic steel industry in recent years will encourage imports through 1980's. • Import controls or voluntary restraints limit import participation in U.S. markets; • Favorable transportation economics will allow Western market imports to maintain their market share into the 1990's; • Favorable climate for construction and industrial expansion.
High IMPORT Forecast as Compared with Baseline Forecast	• Greater penetration of imports into U.S. markets so that imports capture market growth and displace some domestic production.	• Poor financial performance of industry brings about additional reductions in domestic capacity; • Favorable climate for construction and industrial expansion.
Low IMPORT Forecast as Compared with Baseline Forecast	• Lower overall growth of Western market demand.	• Slowed economic growth in U.S.; • Lower levels of construction and industrial expansion; • Domestic industry becomes more competitive; • Possibly, greater import controls.
EXPORT Forecast	• Continuation of trade at present levels.	• Certain U.S. steel products continue to be competitive in the world market (such as sheet steel) and continue to be exported at current levels.
DOMESTIC Forecast	• Continuation of trade at present levels.	• Increase in shipments to Hawaii are limited by increased competition from Japanese producers and other Pacific Coast ports.

Other Movements

Other iron and steel movements are forecast at current levels as shown in Table 57. Domestic shipments are primarily to Hawaii for use in construction and manufacturing and are expected to continue at present levels. Increases in shipments are limited by increased competition from Japanese producers and with other Pacific Coast ports. Foreign exports are also forecast at present levels since certain U.S. products--such as sheet steel--which are competitive in the world market are expected to continue to be exported at current levels. These forecasts are supported by local interviews with representatives of U.S. Steel, Kaiser Steel, and Judson Steel.

Table 57

SAN FRANCISCO BAY AREA
IRON AND STEEL PRODUCTS
DOMESTIC SHIPMENTS, FOREIGN EXPORTS
(thousands of short tons)

	Actual	Forecast			
	1978	1985	1990	2000	2020
Baseline, High & Low:	103	103	103	103	103

VI. NEWSPRINT
COMMODITY 2621

Newsprint has grown somewhat from 2.5 percent in 1969 to 2.7 percent of San Francisco Bay dry cargo in 1978. Foreign imports have been the only significant moves and have fluctuated from 150,000 and 250,000 tons. Table 58 presents recent cargo volumes for the Bay Area for 1969-1978. The 1978 import value has been adjusted to bring it in line with information from industry producers

Table 58

SAN FRANCISCO BAY AREA
STANDARD NEWSPRINT
Short Tons

Year	Imports	Exports	Receipts	Shipments
1969	214,004	159	2	194
1970	210,883	407	0	221
1971	149,799	237	0	497
1972	187,476	2	0	540
1973	237,949	20	0	381
1974	239,595	424	94	235
1975	180,959	357	0	0
1976	253,618	466	0	0
1977	211,153	1,382	0	0
1978[A]	250,000	5,534	0	3

[A] Adjusted downward from 345,263, to correct a probable error in Census data.

Source: Waterborne Commerce of the United States, Part V, U.S. Army Corps of Engineers, 1969-1978.

FOREIGN IMPORTS

Newsprint imports into the Bay Area, shown in Table 59, have grown at about 1.9 percent* between 1969 and 1977 while overall Pacific Coast imports have grown at 0.81 percent. Though the Bay Area has gained coastal share slightly in this period, there is no evidence of a significant shift among ports.

*The compound annual growth rate from 1969 to 1977 shows a decline of .17 percent annually. The regression rate of 1.9 percent increase is based on all years of data. Both measures indicate low rates of change.

Table 59

MAJOR PACIFIC COAST PORTS
NEWSPRINT IMPORTS
Short Tons)

Year	San Francisco Bay	Los Angeles/ Long Beach	Seattle	Pacific Coast
1969	214,004	288,439	85,517	641,959
1970	210,883	280,952	74,911	640,738
1971	149,799	265,403	113,991	601,458
1972	187,476	366,813	95,808	716,123
1973	237,949	329,684	128,707	765,024
1974	239,595	304,032	105,516	715,331
1975	180,959	235,744	142,388	602,532
1976	253,618	236,442	123,122	777,010
1977	211,153	248,571	103,333	664,994
1978[A]	345,763	299,088	181,698	826,234

[A] Uncorrected values.

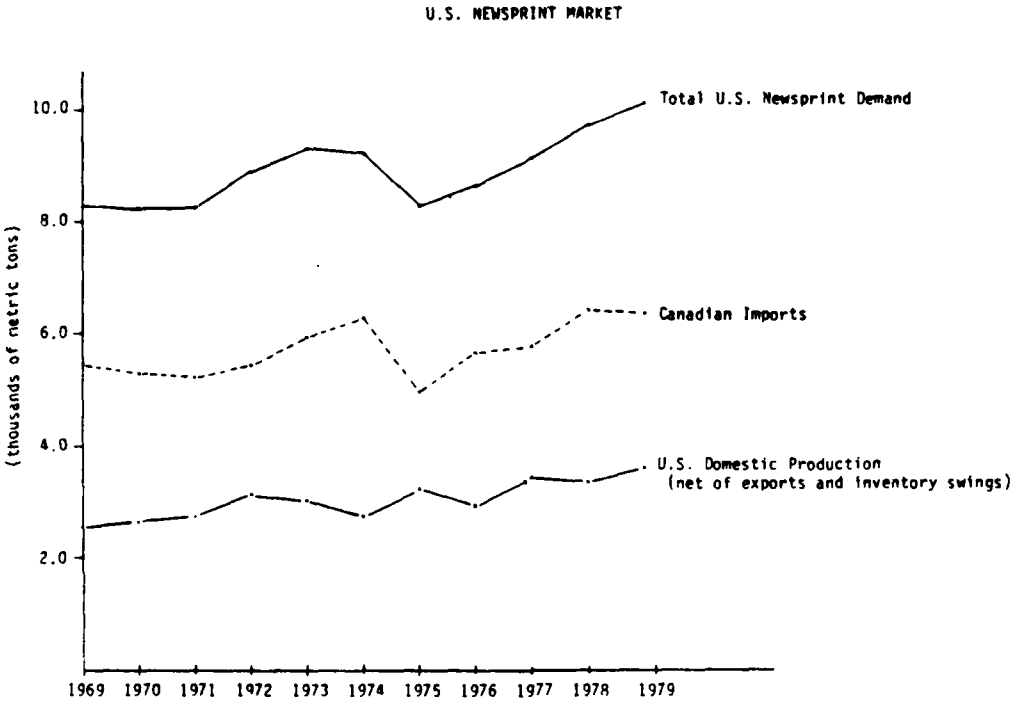
Source: U.S. Waterborne Commerce of the United States, Part 1, U.S. Army Corps of Engineers, 1969-1978.

KEY FACTORS

As shown in Table 60 the total U.S. market, Canadian imports, and U.S. domestic production have increased during the period 1969-1979. The U.S. market grew by 1.71 percent, Canadian imports grew by 1.61 percent, and domestic production grew 2.98 percent annually. The higher rate of growth for U.S. production is the result of new productive capacity which has come on line in recent years. Imports of Canadian newsprint, both overland and waterborne, have risen and fallen with total U.S. demand between 1969 and 1978 while domestic production has grown very smoothly. This would appear to indicate Canadian imports fulfill a reserve capacity role during periods of fluctuating demand.

Table 61 shows similar trends for the West Coast newsprint market. Total demand has displayed a considerable growth trend since the 1975 recession. Canadian imports, both overland and waterborne, have also displayed an upward trend, excepting 1979.

Table 60



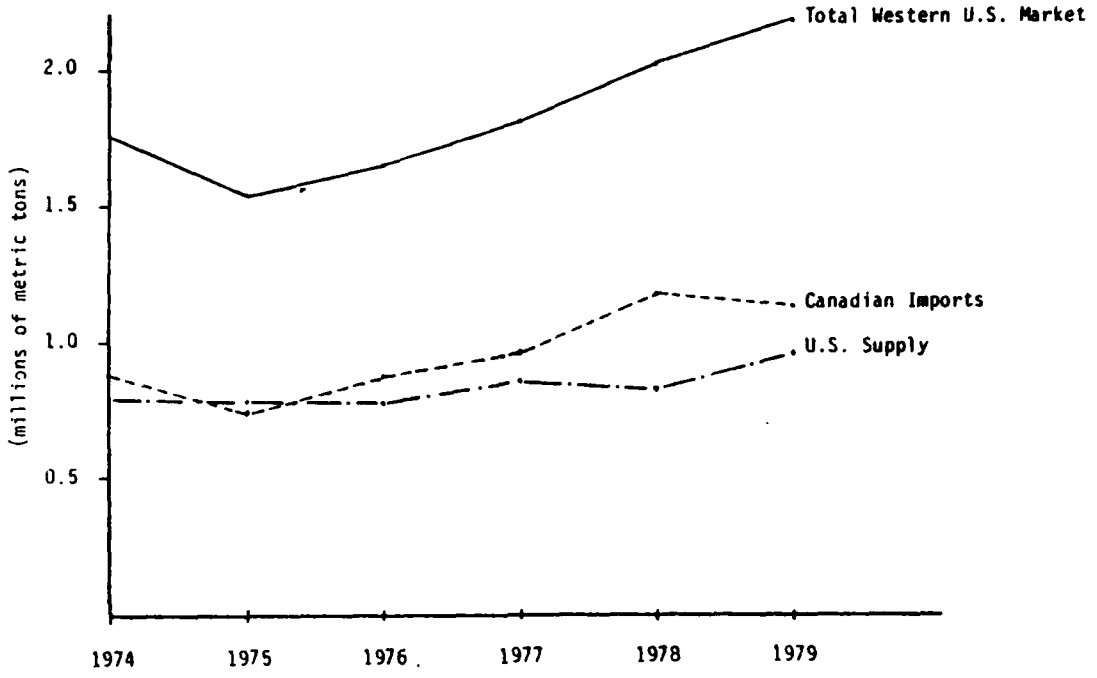
U.S. NEWSPRINT MARKET
(thousands of metric tons)

Year	U.S. Production Net of Export & Inventory Changes	Percent	Canadian Imports	Percent	European Imports	Percent	Total Consumption Net of Inventory Changes
1969	2,562	30.9	5,469	66.1	249	3.0	8,280
1970	2,644	32.4	5,242	64.3	267	3.3	8,153
1971	2,728	33.2	5,228	63.5	270	3.3	8,226
1972	3,168	35.6	5,468	61.3	279	3.1	8,915
1973	3,026	32.4	5,970	64.0	332	3.6	9,328
1974	2,738	29.6	6,304	68.3	193	2.1	9,235
1975	3,273	39.5	4,980	60.1	30	0.4	8,283
1976	2,910	33.7	5,671	65.7	52	0.6	8,633
1977	3,412	37.2	5,751	62.8	0	--	9,163
1978	3,338	34.2	6,429	65.8	0	--	9,767
1979	3,613	35.7	6,371	63.0	132	1.3	10,116

Source: Newsprint Data, Canadian Pulp and Paper Association, 1969-1979.

Table 61

WEST COAST NEWSPRINT MARKET



WEST COAST NEWSPRINT MARKET
(thousands of metric tons)

Year	U.S. Production	Percent	Canadian Imports	Percent	European Imports	Percent	Total Demand
1974	798	45.4	879	50.0	82	4.7	1,759
1975	775	50.2	748	48.5	20	1.3	1,543
1976	773	46.8	878	53.2	0	--	1,651
1977	856	47.2	957	52.8	0	--	1,813
1978	839	41.5	1,185	58.5	0	--	2,024
1979	957	43.6	1,144	52.1	94	4.3	2,195

Source: Newsprint Data, Canadian Pulp and Paper Association, 1974-1979.

The opposite trends observed for U.S. domestic production and Canadian imports in 1978 were due to newsprint mill strikes in the U.S. Pacific Northwest which decreased domestic production. Increases in Canadian imports partially offset this decline.

Comparisons indicate that the rate of growth of Bay Area newsprint imports has been similar to the growth of Bay Area population. From 1960 to 1976, Bay Area population growth averaged 1.8 percent per year while newsprint imports grew 1.9 percent annually from 1969 to 1977. This suggests that imports retained a relatively constant share of the demand resulting from regional population growth.

FORECAST

The forecast for newsprint incorporates the very gradual growth observed in the past ten years for the Bay Area waterborne imports and anticipates a continuation of current trade patterns where the Bay Area grows at about the same rate as the Pacific Coast

The forecast of newsprint imports, shown in Table 62, projects growth of 1 percent, in the baseline scenario, to 275,000 tons by the year 1990. The forecast is based on an estimated 1980 volume of 250,000 tons that allows for inventory swings brought about by anticipation of the mill strikes.

Table 62

SAN FRANCISCO BAY AREA
NEWSPRINT IMPORTS
(thousands of short tons)

	1980 Estimate	Forecast 1985	1990	2000	2020
High	250	275	305	335	410
Baseline	250	260	275	305	370
Low	250	250	250	250	250

The 1 percent growth rate is slightly below the historic rate in the Bay Area, but the forecast begins with a relatively high 1980 value in comparison with the 1969 - 1977 tonnages. The growth rate is in line with Bay Area population forecasts of 1 percent annually 1975 to 1990 and approximately 0.9 percent from 1990 to 2000.*

The high scenario forecast projects growth at a 2 percent rate through 1990 and then continues at 1 percent. The low scenario projects tonnage at the 1980 level. Compared to the baseline forecast, the high and low scenarios reflect different outlooks as to the share of demand met by imports and the level of U.S. domestic production as summarized in Table 63.

Other movements are small and are not expected to continue into the future.

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*Association of Bay Area Governments (ABAG) projections.

Table 63

SUMMARY OF
BAY AREA CARGO FORECAST FOR
NEWSPRINT

	MAJOR ASSUMPTIONS	SCENARIO OF FUTURE EVENTS
Baseline Forecast	• Continuation of gradual growth at rates observed over past ten years.	• Continued growth of demand at rates similar to population growth; • Continued growth of imports at rates similar to overall growth in demand; • Year-to-year fluctuations in imports in response to fluctuations in demand and domestic production.
High Forecast Compared to Baseline Forecast	• Higher growth through 1990.	• Larger share of demand is met by imports; • Growth of newsprint imports exceeds growth of U.S. domestic production.
Low Forecast Compared to Baseline Forecast	• Continuation of imports at current 1980 levels.	• Higher levels of U.S. domestic production.

VII. GRAINS
COMMODITIES 0102, 0103, 0104, 0105, 0106, 0107, 0111

Between 1969 and 1978, grains grew from 0.86 percent of dry cargo in the Bay Area to 3.9 percent. The major portion of the trade has been foreign exports while domestic shipments have been at significant but lower levels. Foreign imports have been fairly consistent at a very low level and domestic receipts have varied widely from year-to-year. Table 64 present recent cargo flows for the Bay Area.*

Table 64

SAN FRANCISCO BAY AREA
GRAINS
Short Tons

Year	Imports	Exports	Receipts	Shipments
1969	440	22,440	0	48,447
1970	2,279	44,714	0	58,764
1971	85	22,093	23	53,102
1972	60	58,532	22,369	42,480
1973	35	298,782	296	52,013
1974	5	242,099	66,824	48,058
1975	177	362,565	152	56,477
1976	199	183,592	66,452	66,077
1977	249	199,384	22,470	63,749
1978	78	275,564	64	94,590

Source: Waterborne Commerce of the United States, Part 4, U.S. Army Corps of Engineers, 1969-1978.

FOREIGN EXPORTS

Exports from the Bay Area, shown in Table 65, have grown at an annual rate of 34.1 percent from 1969 to 1978. Over the

*This chapter includes all grain cargo in the commodity groups identified above. While these cargos generally move in bulk, some portion may be containerized as explained in Appendix A.

1969-1978 period, the Pacific Coast as a whole has grown at about 8.9 percent annually. Overall, the Bay Area has doubled its share of this trade, but since 1974 has been relatively stable at 1.5 to 3.3 percent of coastal exports.

Table 65

PACIFIC COAST PORTS
GRAIN EXPORTS
Short Tons

Year	San Francisco Bay	Stockton/ Sacramento	Los Angeles/ Long Beach	Longview	Portland	Seattle/ Tacoma	Pacific Coast
1969	22,140	529,526	370,796	1,067,606	2,308,870	1,113,842	6,649,144
1970	44,714	536,985	132,003	1,335,883	2,345,537	1,452,863	7,894,777
1971	22,393	364,000	113,504	734,163	1,845,016	1,144,938	5,907,202
1972	68,532	227,790	965	901,170	2,827,708	1,511,989	7,677,804
1973	298,782	765,135	461,993	1,388,517	4,183,840	2,370,149	11,837,718
1974	242,099	697,511	722,693	1,619,513	4,519,158	1,414,613	10,739,853
1975	362,565	1,210,171	837,865	1,190,184	4,096,262	1,793,092	11,070,915
1976	183,592	1,168,556	535,056	1,974,304	4,786,903	2,580,147	12,181,128
1977	199,984	1,060,609	311,796	1,716,604	4,210,603	1,464,912	9,481,639
1978	275,564	1,103,049	1,314,693	2,229,063	6,832,831	3,101,738	15,684,738

Source: Waterborne Commerce of the United States, Part 4, U.S. Army Corps of Engineers, 1969-1978.

While the Bay Area has maintained its share of trade, the Pacific has fallen somewhat in comparison with all U.S. exports, shown in Table 66. The Pacific Coast has fallen from 15.4 percent of the total U.S. in 1969 to 12.6 percent in 1978. Over the same period, the Pacific Northwest has declined from 86.1 percent to about 81.7 percent while more than doubling the tonnage moved.

Table 66
PACIFIC COAST
GRAIN EXPORTS
Short Tons

Year	California	Percent of Pacific Coast	Pacific Northwest	Percent of Pacific Coast	Pacific Coast	Percent of Total U.S.	Total U.S.
1969	926,481	14.0	5,722,663	86.1	6,649,144	15.4	43,228,508
1970	724,271	9.2	7,170,506	90.8	7,894,777	14.4	55,001,511
1971	500,304	8.5	5,406,897	91.5	5,907,201	11.7	50,586,079
1972	300,297	3.9	7,377,507	96.1	7,677,804	11.2	68,830,182
1973	1,470,384	12.4	10,367,334	87.6	11,837,718	11.5	102,934,635
1974	1,661,908	15.5	9,077,945	84.5	10,739,853	12.7	84,306,864
1975	2,398,865	21.7	8,672,050	78.3	11,070,915	11.9	92,937,323
1976	2,005,505	16.5	10,175,623	83.5	12,181,128	11.7	104,347,736
1977	1,594,120	16.8	7,887,519	83.2	9,481,639	9.6	99,130,403
1978	2,876,134	18.3	12,808,604	81.7	15,684,738	12.6	124,196,321

Source: Waterborne Commerce of the United States, Part 4, U.S. Army Corps of Engineers, 1969-1978

OTHER MOVEMENTS

Domestic receipts have been sporadic, but in large enough volumes to move by barge. Domestic shipments of rice to Hawaii and Puerto Rico, as shown in Table 67, have been a significant portion of the domestic shipments.

Table 67

DOMESTIC SHIPMENTS
RICE
Short Tons

Year	Oakland/Alameda to Hawaii	Oakland/Alameda to Puerto Rico
1973	34,020	--
1974	--	--
1975	38,078	--
1976	33,547	26,199
1977	38,869	16,463

Source: MarAd Domestic Trade Data, Office of Domestic Trade.

KEY FACTORS

Grain exports from the Bay Area, shown in Table 68, have consisted of wheat, rice, corn, and sorghum movements.

Table 68

SAN FRANCISCO BAY
GRAIN EXPORTS
Short Tons

Year	Wheat	Rice	Corn	Sorghum
1969	69	6,827	1,583	10,801
1970	--	11,755	3,620	31,503
1971	98	18,552	2,847	344
1972	70	61,548	5,821	651
1973	188,492	66,631	2,447	26,856
1974	159,457	77,156	2,754	629
1975	220,130	138,130	1,716	249
1976	97,901	127,760	2,621	501
1977	60,704	56,599	1,078	33,057
1978	71,452	53,792	143,807	--

Source: Waterborne Commerce of the United States, Army Corps, 1969-1978.

There have been significant variations in volume from year-to-year as foreign countries have imported U.S. grains in response to poor harvests overseas. These variations are dependent on a variety of changing weather and economic factors. For the Bay Area, which is not a major grain port area, variations also arise as a function of specific short term contracts as reflected by the year-to-year variations in Table 68. A more constant factor is the change in diet of Pacific Coast trading partners. As shown in Table 69, Japan, Korea and Taiwan import a major share of West Coast grains.

Table 69

GRAIN[1] EXPORTS FROM PACIFIC PORTS BY DESTINATION
CALENDAR YEAR 1979 AND JANUARY-JUNE 1980
(percent)[B]

Country	1979	Jan.-June 1980
Japan	36	43
Korea	18	16
Taiwan	10	6
China	7	6
U.S.S.R.	6	4
Philippines	5	3
Bangladesh	2	8
Iran	3	--
Iraq	1	1
India	--	--
Other	12	13
Total	100	100
Total Grains[C]	689,133	405,627

[1] Wheat, oats, barley, rye, flaxseed, corn, sorghum, soybeans.
[B] Percent of total grains shipped out of Pacific ports in these time periods.
[C] 1,000 bushels.

Source: Grain Market news; mid-month issues giving monthly figures, U.S. Department of Agriculture.

Though grain is a significant share of Bay Area trade, Stockton/Sacramento, the Pacific Northwest, and Los Angeles/Long Beach are expected to continue to ship the majority of the Pacific Coast grain in the growing trades with China, India, and Russia. The Bay Area will benefit from the continued growth of the Stockton/Sacramento trade since vessels often "top-off" in San Francisco after loading in the Delta.

FORECAST

Exports

The forecast of grain exports is based on a recent study by the U.S. Department of Agriculture. The study forecast the levels of U.S. exports using the U.S.D.A. National Interregional Agriculture Projections Systems (NIRAP) for the Ogallala Aquifer Study (the Ogallala Aquifer includes the Mississippi River and surrounding states). Table 70 shows the volume and rate of growth for all U.S. exports of the grains important in the Bay Area.

Table 70

U.S. GRAIN EXPORT FORECAST

(millions of bushels)

	1985		1990		2000		2020
Wheat	1,558		1,851		2,442		4,057
% Growth		3.5%		2.8%		2.6%	
Corn	2,907		3,478		4,533		7,983
% Growth		3.7%		2.7%		2.9%	
Rice	103		120		157		256
% Growth		3.1%		2.7%		2.5%	

Source: Dr. LeRoy Quance, Ogallala Aquifier Area Study Baseline Projection

The Bay Area forecast shown in Table 71 begins with a 1979 estimate of 420,000 tons that includes the recent increases in grain exported to China and other grain exports as shown in Census 305/705 data. The baseline forecast includes continued growth at 6 percent per year through 1985. Thereafter, growth is projected at a 3 percent rate, close to the rates used in the Ogallala Aquifer Study.

Table 71
SAN FRANCISCO BAY AREA
GRAIN EXPORTS
(thousands of short tons)

	Estimate	Forecast			
	1979	1985	1990	2000	2020
High	420	665	890	1,200	2,100
Baseline	420	595	690	930	1,680
Low	420	500	580	780	1,410

The high scenario projects growth at 8 percent annually through 1985, at 6 percent through 1990, and at 3 percent thereafter. The low scenario grows at the long term rate of 3 percent throughout the forecasting period. Though the forecasts show steady growth over the years, grains will continue to show substantial fluctuations as weather and world markets influence the year-to-year demand for U.S. grain.

The near-term high growth rates allow for the recent and projected increase in exports to Japan, Korea, Taiwan, and China. Compared to the baseline forecast, the high and low scenarios vary as to the growth of export trade and the growth of tonnages through Stockton and Sacramento as described in Table 72. Deeper channels to Sacramento and Stockton could affect the tonnages handled and are one of the factors supporting the high forecast.

Other Movements

Domestic shipments, forecast in Table 73, have shown steady growth of about 3 percent over the 1969-1978 period and are expected to continue to grow at 2 percent per year under the baseline forecast, at 3 percent under the high scenario, and to remain at current levels for the low scenario. Continued shipments to Hawaii and Puerto Rico support this forecast.

Table 72

SUMMARY OF
BAY AREA CARGO FORECAST FOR
GRAINS

	MAJOR ASSUMPTIONS	SCENARIO OF FUTURE EVENTS
Baseline Forecast for EXPORTS	• High growth since 1978 included in forecasts; • Continued high growth to 1985; • Thereafter, steady growth at lower, longer term rate based on recent U.S.D.A. forecast.	• Continued increase in exports to Japan, Korea, Taiwan, and China, particularly over next five years; • Stockton/Sacramento, Pacific Northwest, and LA/Long Beach continue to ship majority of Pacific Coast trade; • Bay Area benefits from continued growth of Stockton/Sacramento trade since vessels top off in San Francisco after loading in Delta
High EXPORT Forecast as Compared with Baseline Forecast	• Higher growth rate from 1979 - 1990.	• Greater increase in exports to Japan, Korea, Taiwan and China; • Greater growth of tonnages through Stockton and Sacramento.
Low EXPORT Forecast as Compared with Baseline Forecast	• Lower growth rate over next five years.	• Less overall growth in grain exports; • Less growth for Stockton and Sacramento.
Baseline Forecast for SHIPMENTS	• Continued growth at rates experienced over 1969 - 1978 period;	• Continued growth in trade with Hawaii and Puerto Rico;
High and Low Forecasts for SHIPMENTS as Compared with Baseline	• Slightly higher growth for high forecast and continuation of trade at current levels for low.	• Range of possibilities in trade with Hawaii and Puerto Rico.

Table 73

SAN FRANCISCO BAY AREA
GRAIN DOMESTIC SHIPMENTS
(thousands of short tons)

	Actual	Forecast			
	1978	1985	1990	2000	2020
High	95	115	135	180	325
Baseline	95	105	120	145	215
Low	95	95	95	95	95

There are, in addition, small amounts of grain imports and receipts which are included in the other bulk forecast in Chapter XII.

VIII. IRON AND STEEL SCRAP
COMMODITY 4011

Iron and steel scrap has fallen from 8.8 percent to 6.1 percent of the Bay Area dry cargo between 1969 and 1978. The major portion of the trade has been foreign exports while domestic receipts have been at low levels. Table 74 reviews recent cargo volumes in the Bay Area for 1969-1978.

Table 74

SAN FRANCISCO BAY AREA
IRON AND STEEL SCRAP
Short Tons

Year	Imports	Exports	Receipts	Shipments
1969	145	751,125	933	0
1970	3	726,503	1,058	0
1971	0	556,305	976	47
1972	829	504,526	1,276	301
1973	25	791,015	5,748	57
1974	22	592,048	10,114	61
1975	0	403,547	3,499	0
1976	1	409,773	8,894	20
1977	2	443,080	6,892	8,741
1978	116	564,134	6,753	0

Source: Waterborne Commerce of the United States, Part 4, U.S. Army Corps of Engineers, 1969-1978.

FOREIGN EXPORTS

Iron and steel scrap exports in the Bay Area, shown in Table 75, have shown a declining trend. Between 1969 and 1978, iron and steel scrap exports in the Bay Area fell at an annual rate of 6.04 percent. Over the 1974 to 1978 period, Bay Area exports have been nearly constant with .03 percent annual rate of decline.

Table 75

MAJOR PACIFIC COAST PORTS
IRON AND STEEL SCRAP EXPORTS
Short Tons

Year	San Francisco Bay	Los Angeles/ Long Beach	Tacoma	Portland	Total
1969	751,125	715,889	119,212	153,194	1,739,420
1970	726,503	885,090	156,759	338,462	2,106,814
1971	556,305	436,255	38,470	108,142	1,139,172
1972	504,526	622,095	87,345	204,319	1,418,285
1973	791,015	205,755	208,717	397,649	1,603,136
1974	592,048	773,882	129,786	263,817	1,759,533
1975	403,547	658,341	115,635	256,757	1,434,280
1976	409,773	596,966	158,504	258,179	1,423,422
1977	443,080	717,718	87,520	162,372	1,410,690
1978	564,134	661,670	196,039	272,385	1,694,228

Source: Waterborne Commerce of the United States, Part 4, U.S. Army Corps of Engineers, 1969-1978.

The major Pacific Coast ports, also shown in Table 75, have about the same trend with tonnage falling by 1.09 percent annually over the 1969-1978 period and falling by .92 percent between 1974 and 1978. The Bay area share has been fairly constant at an average of 36.5 percent of the major ports.

KEY FACTORS

Exports of scrap are destined for Japanese and Korean steel mills where scrap is a major component of steel making in electric furnaces. The U.S. is a major source of scrap for foreign steel production and the continued growth of electric furnaces, which require more scrap than conventional furnaces, will encourage scrap exports. The ferrous scrap used in the steel industry is obtained principally from the waste of industrial finishing processes and from salvage of obsolete machinery and automobiles. A key factor in scrap exports in the past has been U.S. government regulation. In early 1979, as the price of scrap rose from $80 to $130 a ton, the steel industry requested, as they had in several earlier years, the restriction

of scrap exports. In 1974, the Department of Commerce imposed such controls, but in 1979 as domestic steel demand declined, the request was rejected.

FORECAST

The iron and steel scrap exports forecast shown in Table 76 projects 400,000 to 600,000 tons annually for the Bay Area, or about the current level of trade. The baseline forecast is projected at 450,000 tons, which is a more typical recent volume than the high level of exports in 1978. Scrap will continue to show wide swings from year-to-year since it is often stockpiled in anticipation of price increases. Bay Area supply is primarily "domestic" scrap--automobiles, appliances and building materials--and can be expected to continue to be available at current levels. Stability rather than growth in supply is likely with low overall Bay Area industrial growth.

Table 76

SAN FRANCISCO BAY AREA
IRON AND STEEL SCRAP EXPORTS
(thousands of short tons)

	Actual	Forecast			
	1978	1985	1990	2000	2020
High	564	600	600	600	600
Baseline	564	450	450	450	450
Low	564	400	400	400	400

Other movements of scrap are included in the forecast of other bulk cargos in Chapter XII.

IX. PETROLEUM COKE
COMMODITY 2920 AND 3313

Between 1969 and 1978, petroleum coke has been steady at 3.4 percent and 3.3 percent of San Francisco Bay Area dry cargo. The major coke movements have been foreign exports. Table 77 presents recent movements of coke in the Bay Area.

Table 77

SAN FRANCISCO BAY AREA
PETROLEUM COKE
Short Tons

Year	Imports	Exports	Receipts	Shipments
1969	43,782	251,596	0	0
1970	101	229,916	0	0
1971	175,479	268,913	0	0
1972	118,434	319,731	0	0
1973	10	532,774	0	0
1974	18,422	520,568	0	0
1975	50,671	329,557	0	0
1976	29,828	411,063	0	0
1977	64,091	352,313	0	0
1978	24,158	282,931	0	12

Source: Waterborne Commerce of the United States, Part 4, U.S. Army Corps of Engineers, 1969-1978.

FOREIGN EXPORTS

Foreign exports of petroleum coke are to Japan and Europe, for use as fuel in steel making and power generation. Over the 1969-1978 period, exports have grown at an annual rate of 3.9 percent but have declined since the 1973 peak.

KEY FACTORS

Petroleum coke is produced as part of the crude petroleum refining process and is frequently blended with coal as furnace fuel. Foreign demand for fuel grade coke is expected

to continue to grow as is domestic demand as emission concerns are met through scrubbers and facilities are encouraged to switch from liquid fuels. A second use for coke (calcined coke) is as anodes in aluminum smelting and electric arc steel production. Calcined coke requires additional processing to meet chemical composition standards. The Exxon refinery in Benicia, the current source of Bay Area coke, produces only fuel coke.

The primary constraint on coke exports will be refinery capacity. Currently, the Exxon refinery has a nominal rate of 1,000 tons per day or 365,000 tons annually. The Bay Area exports from Benicia were 260,232 tons in 1978 and 325,313 in 1977.

FORECAST

As shown in Table 78, coke exports are forecast to continue at between 250,000 and 350,000 tons annually. Exxon officials do not anticipate any expansion of refinery capacity in the near term and long-term expansion will depend on both environmental and industry factors.

Table 78

SAN FRANCISCO BAY AREA
PETROLEUM COKE EXPORTS
(thousands of short tons)

	Actual	Forecast			
	1978	1985	1990	2000	2020
High	283	350	350	350	350
Baseline	283	300	300	300	300
Low	233	250	250	250	250

Coke imports are included with other bulk in Chapter XII.

X. SUGAR

COMMODITY 2061

Sugar has maintained a steady share at 9.2 and 9.0 percent of the Bay Area dry cargo between 1969 and 1978. The dominant portion of the trade is domestic receipts from Hawaii. Table 79 presents recent cargo volumes for 1969-1978.

Table 79

SAN FRANCISCO BAY AREA
SUGAR
Short Tons

Year	Imports	Exports	Receipts	Shipments
1969	75,632	277	709,707	1,785
1970	108,758	263	645,638	1,918
1971	22,351	961	632,263	2,039
1972	173,231	191	763,346	5,178
1973	29,812	504	758,090	2,607
1974	116,349	1,143	677,458	2,671
1975	13,892	2,962	737,838	2,312
1976	42,846	629	878,014	2,900
1977	25,107	431	710,430	2,047
1978	20,285	245	827,573	1,860

Source: Waterborne Commerce of the United States, Part 4, U.S. Army Corps of Engineers, 1969-1978.

DOMESTIC RECEIPTS

The California and Hawaiian Sugar Company (C&H) receives unrefined sugar and refines and packages it for distribution. Until recently, Matson Lines operated the S.S. Californian, built in 1946, in the Hawaii-Bay Area trade with containers on deck and sugar in the holds. By the end of 1981, C&H plans to introduce its own integrated tug/barge into the trade and until then will move sugar on a variety of vessels, including the Sugar Islander. As shown in Table 80, this trade accounts for over 80 percent of Hawaiian shipments.

Table 80

HAWAIIAN SUGAR
Short Tons

Year	Hawaiian Shipments	San Francisco Bay Receipts	Percent
1974	919,946	677,458	74%
1975	949,631	737,838	78
1976	984,751	878,014	89
1977	887,751	710,430	80
1978	967,598	327,573	86

Source: Waterborne Commerce of the United States, Part 4 U.S. Army Corps of Engineers, 1969-1978.

KEY FACTORS

Hawaiian sugar has a modest price advantage over foreign imports because of the raw sugar duty (typically 2-3 cents per pound) and U.S. import fees (typically 3-3.5 cents per pound). This advantage coupled with low cost water transportation insures that Hawaii will continue to be the first choice supplier for California. Though sugar manufacturers face competition from non-nutritive sweetners, high fructose corn syrups, and foreign suppliers, the Hawaiian-San Francisco Bay trade will probably reflect this competition only in year-to-year fluctuations similar to those already observed.

FORECAST

The forecast for sugar receipts, shown in Table 81 projects a 700,000 to 950,000 ton level for the Bay Area. These levels reflect the continued operation of the C&H facilities in Crockett at historic volumes. According to

C&H officials, there is some potential for expansion of refinery capacity in the long-term, but capacity will probably expand by only 5 to 10 percent from the current 875,000 ton rated capacity. As in the past actual receipts will be somewhat below capacity.

Table 81

SAN FRANCISCO BAY AREA
SUGAR RECEIPTS
(thousands of short tons)

	Actual	Forecast			
	1978	1985	1990	2000	2020
High	828	950	950	950	950
Baseline	828	830	830	830	830
Low	828	700	700	700	700

The forecast of Bay Area sugar receipts is dependent on the capacity and level of operations of the major refinery in the Bay Area. While demand for sugar from Bay Area residents influences those operations, it is only one of several factors determining how much sugar is refined here and the markets to which that sugar is sold. Thus, while sugar consumption is likely to grow as Bay Area population increases, the amount of bulk sugar brought into the region via water transportation is not necessarily related to those trends. For example, sugar purchased by Bay Area consumers could be C&H sugar refined in the Bay Area or it could be other brands of sugar refined or packaged elsewhere and transported to the Bay Area by truck or rail.

Other movements are included in the other bulk forecast in Chapter XII.

XI. SALT
COMMODITY 1491

Salt has declined from 6.9 to 1.8 percent of all Bay Area dry cargo between 1969 and 1978. The major portion of the trade, as shown in Table 82, has been foreign exports. The Leslie Salt Company in Redwood City produces sea salt from evaporating ponds and exports by barge primarily to Vancouver, British Columbia. San Francisco Bay is unique in that most ports on the Pacific Coast import salt.

Table 82

SAN FRANCISCO BAY AREA
SALT
Short Tons

Year	Imports	Exports	Receipts	Shipments
1969	9	441,31[illegible]	92	149,517
1970	6	196,426	0	183,405
1971	36	400,231	0	92,325
1972	2	422,214	30	3,243
1973	30	151,682	0	13,348
1974	0	104,167	42	5,370
1975	9	99,802	115	4,653
1976	2	152,980	157	5,502
1977	3	119,609	0	4,704
1978	116	164,312	0	5,020

Source: Waterborne Commerce of the United States, Part 4, U.S. Army Corps of Engineers, 1969-1978.

KEY FACTORS

Salt is used in fish packing and processing, production of forest products, and in the chemical industry, and will continue to be in steady demand. The key factor for the Bay Area is the significant competition from Mexican producers in the Baja Peninsula. The relatively low levels of exports in

the mid-1970s primarily reflected a lack of contracts due to increased competition from these producers. Year-to-year fluctuations reflect changing contracts which generally run 3-5 years.

The decline in domestic shipments shown in Table 82 occurred when Leslie lost its domestic market in the Pacific Northwest to these same Baja producers. While the Bay Area offers some locational advantage in the northwest, there are more favorable shipping rates for the route from Baja due to the Jones Act requirement that domestic producers use American flag vessels while the competition uses foreign carriers. For this reason, Bay Area domestic trade is not expected to grow.

FORECAST

As shown in Table 83, salt is expected to continue to be exported from the Bay Area at the 150,000 to 300,000 ton level. Leslie Salt officials report that constraints on available land and brine for evaporating ponds will limit Redwood City production in the long run to around 300,000 tons annually. In peak years, production could approach 400,000 tons, but could not be sustained. Competitive pressures in the early 1970s forced production down to about 100,000 tons, but sales have recovered and are expected to continue at around 200,000 tons per year.

Table 83

SAN FRANCISCO BAY AREA
SALT EXPORTS
(thousands of short tons)

	Actual	Forecast			
	1978	1985	1990	2000	2020
High	164	300	300	300	300
Baseline	164	200	200	200	200
Low	164	150	150	150	150

XII. OTHER BULK CARGO

Bulk cargo movements of coal, cement, and limestone are currently at low levels in the Bay Area but may present significant volumes in the future.

CEMENT/LIMESTONE

As shown in Table 84, cement and limestone movements have varied widely from year-to-year with limestone imports being the major cargo.

Table 84

SAN FRANCISCO BAY AREA
OTHER BULK CARGO
(short tons)

Year	Cement Domestic Shipments (3241)	Limestone Imports (1411)	Cement Domestic Receipts (3241)[A]
1969	430,341	208,757	58
1970	471,376	241,945	1,220
1971	103	81,793	83,997
1972	29,883	260,380	49,992
1973	392	187,338	6,453
1974	30,376	198,742	7,991
1975	46,429	205,427	2,723
1976	61,552	147,524	280
1977	45,782	100,617	392
1978	28,143	144,088	849

[A] Army Corps Commodity Codes.

Redwood City has a tentative agreement with Chien-Tai Cement Company of Taiwan and the Indo-Cement Company of Indonesia for a 200,000 - 500,000 ton cement facility to begin operation in 1982. The facility would grind fired limestone and serve as a distribution point for the finished cement. Recent limestone imports in the Bay Area have been at the 150,000 ton level and would increase with the planned facility.

SAND AND GRAVEL

There have been several minor non-internal movements* of sand and gravel over the 1969 to 1978 period, as shown in Table 85, with one significant receipt of 19,000 tons in 1978.

Table 85

SAND AND GRAVEL

Commodity 1442

(short tons)

Year	Imports	Exports	Receipts	Shipments
1969	--	810	--	341
1970	42	1,633	21	995
1971	1,411	3,824	187	661
1972	--	273	--	1,947
1973	19	2,930	--	1,277
1974	40	479	--	175
1975	199	271	25	440
1976	4	352	21	4,430
1977	2	6,375	--	6,149
1978	35	2,802	19,000	1,517

COAL

Coal has significant potential for growth on the Pacific Coast in the next decade. The recently completed World Coal Study (WOCOL) projects that between 13 and 29 million tons of Pacific Coast coal will be exported to Japan, Korea, and other Pacific Basin countries in 2020. The prospects for coal in San Francisco Bay, though, are far from entirely positive. There will be significant price competition from Australian exporters that will require large scale facilities. Also, a variety of delays from environmental interests, both at the Western mines and at the loading facilities, can be anticipated.

Additionally, the ports of Los Angeles/Long Beach have already announced expansion of their bulk facilities to handle

*Most sand and gravel moves within the Bay Area from one Bay Area location to another. The non-internal movements included here exclude this internal traffic.

the 4 - 6 million tons of Pacific Coast coal per year expected by 1990. There are also continuing discussions of major coal facilities in Bellingham, Washington.

FORECAST

The high forecast, shown in Table 86, includes 5,000,000 tons of coal in the Bay Area by 1990. Though San Francisco could serve as a major coal facility because of its deepwater access, it is likely that environmental considerations and potential land use conflicts would limit the Bay to a modest facility. San Francisco might serve to "top-off" vessels loaded in the Delta much as it does with grains. The high forecast also includes 400,000 tons of limestone imports for the potential cement facility. Finished cement might also be distributed domestically by barge, but is not included in the forecast. The low and baseline forecasts include the limestone, cement, and sand and gravel cargos at current levels, as well as the small amounts of bulk cargo in Table 87.

Table 86

SAN FRANCISCO BAY AREA
OTHER BULK CARGO
(thousands of short tons)

	Estimate	Forecast			
	1980	1985	1990	2000	2020
High	255	455	5,455	5,455	5,455
Baseline	255	255	255	255	255
Low	255	255	255	255	255

Table 87

SAN FRANCISCO BAY AREA
SMALL BULK CARGO TONNAGES INCLUDED IN OTHER BULK FORECAST
(short tons)

	Imports	Exports	Receipts	Shipments
Grains	78	--	64	--
Scrap	116	--	6,753	--
Coke	24,158	--	--	12
Sugar	20,285	245	--	1,860
Salt	116	--	--	5,020

The several minor cargo tonnages not forecast in earlier dry bulk cargo chapters are included at current levels in the other bulk cargo forecast, since no major changes in tonnages are expected. The tonnages are shown in Table 87.

Appendix A

CARGO SECTOR DEFINITIONS AND ARMY CORPS OF ENGINEERS COMMODITY GROUPS

APPENDIX A

CARGO SECTOR DEFINITIONS AND ARMY CORPS OF ENGINEERS COMMODITY GROUPS

This appendix reviews the cargo groups used to analyze and forecast Bay Area dry cargo. The eleven groups selected for the forecast are defined in Table A-1. The 4-digit commodity codes are from the Army Corps Commodity Classification for Domestic Waterborne Commerce. These are presented in Table A-2 (at the end of Appendix A). The commodity codes for the liquid cargos excluded from the scope of this forecasting effort are shown in Table A-3 (at the end of Appendix A). The commodity groups for the dry cargo included in the forecast are all those remaining on the list in Table A-2 after the liquid cargo commodity codes are excluded.

The cargo sector definitions in Table A-1 describe the source of the data used to define each sector as well as the source for identifying recent and 1978 base year tonnages. Except as noted for containerized cargo, the base data is from the Army Corps' publication Waterborne Commerce of the United States, Part 4. Bay Area cargo is defined to include cargo at San Francisco, Oakland/Alameda, Redwood City, Richmond, San Pablo Bay, and Carquinez Straits as compiled by the Corps.

The following are comments regarding the cargo sector definitions in Table A-1:

- Some small amounts of liquid cargo carried in tank containers or in drums inside containers and trailers are probably included in the MarAd containerized cargo data and in the Army Corps and Census defined carriage of dry cargo vessels;

Table A-1

SAN FRANCISCO BAY AREA CARGO FORECAST

CARGO SECTOR DEFINITIONS[A]

Group	Source
Containerized Cargo	Foreign imports and exports - Maritime Administration MA578A data, adjusted by TBS (per Appendix B)
	Domestic shipments and receipts - Corps dry cargo for Oakland and San Francisco, net of other cargo sectors
Breakbulk Cargo	Foreign imports and exports - Corps dry cargo net of other cargo groups
	Domestic shipments and receipts - Corps dry cargo for Redwood City, Richmond, San Pablo Bay and Carquinez, net of other cargo sectors
Neobulk Cargo	
Automobiles	Commodity 3711
Iron and Steel Products	Commodities 3314, 3315, 3316, 3317, 3318 and 3319
Newsprint	Commodity 2621
Dry Bulk Cargo	
Grains	Commodities 0102, 0103, 0104, 0105, 0106, 0107 and 0111
Iron and Steel Scrap	Commodity 4011
Coke	Commodities 2920 and 3313
Sugar	Commodity 2061
Salt	Commodity 1491
Other Bulk	Commodities 3241, 1442, 1411, 1121

[A] As reported in Waterborne Commerce of the United States, Part 4 - Army Corps of Engineers, but excluding liquid cargos. 4-digit commodity codes are from the Commodity Classification for Domestic Waterborne Commerce, compiled by the Army Corps.

- Cargo carried by high technology ships such as Ro/Ro vessels and barge carriers are included in several cargo sectors:

  - Ro/Ro trailer and container cargos are included in the container group. Autos and other motor vehicles usually moved on specialized car carriers are separately defined as the auto cargo sector. Palletized Ro/Ro cargos and wheeled machinery on Ro/Ro vessels are included in the breakbulk group for foreign trade and in the container cargo group for domestic trade. In terms of tonnages, most of the non-automobile Ro/Ro cargo is in the container cargo group.

  - LASH cargos are included as containers, breakbulk, scrap, or grain and cannot be easily identified. The difficulty in separately identifying LASH shares of these cargos is not a major problem since LASH operations have declined to low levels with the termination of Pacific Far East Lines service in the Bay Area and are not expected to increase.

- The container cargo group includes peacetime levels of military cargo carried in commercial vessels. In addition, there is probably a small amount of military breakbulk cargo that has not been separately estimated and added to the base year estimates. Military cargo moving through military terminals on military vessels is excluded from the scope of this forecasting effort.

- There are probably small amounts of dry bulk and neobulk cargos (grains or steel, for example) that are actually carried in containers. This probably introduces the following minor distortions to the data base. For foreign trade: (1) tonnages for the neobulk or dry bulk sectors would be slightly overestimated; (2) tonnages for

containerized cargo would not be affected (since they are derived from the MarAd source); and (3) tonnages for breakbulk cargo would be slightly underestimated (since they are defined as the Corps dry cargo totals net of all other cargo groups). For domestic trade, this situation would result in minor overestimates for the particular dry bulk or neobulk sectors and underestimates in the container group.

Other government data sources (various Maritime Administration and Bureau of Census reports) were used in developing the forecasts (to provide detail on origin, destination, type of carriage, historical trade patterns, etc.). These are discussed in Chapters II through XII as relevant and in Appendix B. Additional information on the factors affecting the trade was compiled from a variety of sources including industry publications, government studies, trade associations, and interviews with industry representatives. These are also cited throughout the text as appropriate.

Table A-2

WATERBORNE COMMERCE OF THE UNITED STATES, 1978

COMMODITY CLASSIFICATION FOR DOMESTIC WATERBORNE COMMERCE

Code No.	Item Name
	Group 01 - Farm Products
0101	Cotton, raw
0102	Barley and rye
0103	Corn
0104	Oats
0105	Rice
0106	Sorghum grains
0107	Wheat
0129	Field crops, NEC*
0131	Fresh fruits and tree nuts,
0132	Bananas and plantains
0133	Coffee, green and roasted (including instant)
0134	Cocoa beans
0141	Fresh and frozen vegetables
0151	Live animals (livestock),
0161	Animals and animal products, NEC[A]
0191	Miscellaneous farm products
	Group 08-Forest Products
0841	Crude rubber and allied gums
0861	Forest products, NEC
	Group 09-Fresh Fish and other Marine Products
0911	Fresh fish, except shellfish
0912	Shellfish, except prepared or preserved
0913	Menhaden
0931	Marine shells, unmanufactured
	Group 10-Metallic ores
1011	Iron ore and concentrates
1021	Copper ore and concetrates
1051	Buaxite and other aluminum ores and concentrates
1061	Manganese ores and concentrates
1091	Nonferrous metal ores and concentrates, NEC
	Group 11-Coal
1121	Coal and lignite
	Group 13-Crude Petroleum
1311	Crude petroleum
	Group 14-Nonmetallic minerals, Except Fuels
1411	Limestone flux and calcareous stone
1412	Building stone, unworked
1442	Sand, gravel and crushed rock
1451	Clay ceramic and refractory materials
1471	Phosphate rock
1479	Natural fertilizer materials, NEC
1491	Salt
1492	Sulphur, dry
1493	Sulphur, liquid
1494	Gypsum, crude and plasters
1499	Nonmetallic minerals, except fuels,NEC
	Group 19-Ordnance and Accessories
1911	Ordnance and accessories
	Group 20-Food and Kindred Products
2011	Meat,fresh, chilled,or frozen
2012	Meat and meat products prepared or preserved
2014	Tallow, animal fats and oils
2015	Animal by-procucts, except dried milk and cream
2021	Dairy products, except dried milk and cream
2022	Dr ed milk and cream
2031	Fish and fish products, including shellfish
2034	Vegetables and preparations, canned and otherwise
2039	Fruits and fruit and vegetable juices,

Code No.	Item Name
	Group 01 - Farm Products (continued)
0111	Soybeans
0112	Flaxseed
0119	Oilseeds, NEC
0121	Tobacco, leaf
0122	Hay and fodder
	Group 20-Continued
2041	Wheat flour and semolina
2042	Prepared animal feeds
2049	Grain mill products, NEC
2061	Sugar
2062	Molasses
2081	Alcoholic beverages
2091	Vegetable oils, all grades; margarine and shortening
2092	Animal oils and fats, NEC
2094	Groceries
2095	Ice
2099	Miscellaneous food products
	Group 21-Tabacco Procucts
2111	Tabacco manufactures
	Group 22-Basic Textiles
2211	Basic textile products, except textile fibers
2212	Textile fibers, NEC
	Group 23-Apparel and Other Finished Textile Products
2311	Apparel and other finished textile products
	Group 24-Lumber and Wood Products Except Furniture
2411	Logs
2412	Rafted logs
2413	Fuel wood, charcoal, and wastes
2414	Tumber, posts, poles, piling, other rough wood
2415	Pulpwood, log
2416	Wood chips, staves, molding, and excelsior
2421	Lumber
2431	Veneer, plywood, and other worked wood
2491	Wood manufactures, NEC
	Group 25-Furniture and Fixtures
2511	Furniture and Fixtures
	Group 26-Pulp, Paper and Allied Products
2611	Pulp
2621	Standard newsprint paper
2631	Paper and paperboard
2691	Pulp, paper and paperboard products, NEC
	Group 27-Printed Matter
2711	Printed matter
	Group 28-Chemicals and Allied Products
2810	Sodium hydroxide (caustic soda)
2811	Crude products from coal tar, petroleum, and natural gas, except benzene and toluene
2812	Dyes, organic pigment, dyeing and tanning materials
2813	Alcohols
2816	Radioactive and associated materials, including wastes
2817	Benzene and toluene, crude and commercially pure
2818	Sulphuric acid
2819	Basic chemicals and basic chemical products, NEC

[A] NEC - not elsewhere classified.

Table A-2
(continued)

COMMODITY CLASSIFICATION FOR DOMESTIC WATERBORNE COMMERCE

Code No.	Item Name
2821	Plastic materials, regenerated cellulose and synthetic resins, including film,
2822	Synthetic rubber
2823	Synthetic (man-made)fiber
2831	Drugs(biological products, medicinal chemicals,botanical products and pharmaceutical preparations)
2841	Soap, detergents, and cleaning preparations; perfumes, cosmetics and other toilet preparations
2851	Paints, vernishes, lacquers, enamels, and allied products
2861	Gum and wood chemicals
2871	Nitrogenous chemical fertilizers, except mixtures
2872	Potassic chemical fertilizers, except mixtures
2873	Phosphatic chemical fertilizers, except mixtures
2876	Insecticides, fungicides, pesticides, and disinfectants
2879	Fertilizers and fertilizer materials, NEC[A]
2891	Miscellaneous chemical products
	Group 29-Petroleum and Coal Products
2911	Gasoline, including natural gasoline
2912	Jet fuel
2913	Kerosene
2914	Distillant fuel oil
2915	Residual fuel oil
2916	Lubricating oils and greases
2917	Naphtha, mineral spirits, solvents NEC
2918	Asphalt, tar, and pitches
2920	Coke, including petroleum coke
2921	Liquefied petroleum gases, coal gases, natural gas, and natural gas liquids
2951	Asphalt building materials
2991	Petroleum and coal products, NEC
	Group 30-Rubber and Miscellaneous Plastics Products
3011	Rubber and miscellaneous plastics products
	Group 31- Leather and Leather Products
3111	Leather and leather products
	Group 32-Stone, Clay, Glass, and Concrete Products
3211	Glass and glass products
3241	Building cement
3251	Structural clay products, including refractories
3271	Lime
3281	Cut stone and stone products
3291	Miscellaneous nonmetallic mineral products
	Group 33-Primary Metal Products
3311	Pig iron
3312	Slag
3313	Coke(coal and petroleum),petroleum pitches asphalts, and naphtha and solvents
3314	Iron and steel ingots, and other primary forms, including blanks for tube and pipe, and sponge iron
3315	Iron and steel bars, rods, angles, shapes and sections, including sheet piling
3316	Iron and steel plates and sheets
3317	Ferroalloys
3319	Primary iron and steel products, NEC including castings in the rough
3321	Nonferrous metals primary smelter products, basic shapes, wire, castings and forgings, except copper, lead, zinc and aluminum
3322	Copper and copper alloys, whether or not refined, unworked
3323	Lead and zinc including alloys,unworked
3324	Aluminum and aluminum alloys, unworked
	Group 34-Fabricated Metal Products, Except Ordnance, Machinery, and Transportation Equipment
3411	Fabricated metal products, except ordnance, machinery, and transportation equipment
	Group 35-Machinery, Except Electrical
3511	Machinery, except electrical
	Group 36-Electrical Machinery, Equipment and Supplies
3611	Electrical machinery, equipment and supplies
	Group 37-Transportation Equipment
3711	Motor vehicles, parts and equipment
3721	Aircraft and parts
3731	Ships and boats
3791	Miscellaneous transportation equipment
	Group 38-Instrument, Photographic and Optical Goods, Watches and Clocks
3811	Instruments, photographic and optical goods watches and clocks
	Group 39-Miscellaneous Products of Manufacturing
3911	Miscellaneous products of manufacturing
	Group 40-Waste and Scrap Materials
4011	Iron and steel scrap
4012	Nonferrous metal scrap
4022	Textile waste, scrap, and sweepings
4024	Paper waste and scrap
4029	Waste and scrap, NEC
	Group 41-Special Items
4111	Water
4112	Miscellaneous shipments NEC
4113	LCL freight
4118	Materials used in waterway improvement, Government materials
9998	DOD controlled cargo and special category items

[A] NEC - not elsewhere classified.

Table A-3

LIQUID CARGOS EXCLUDED FROM DRY CARGO GROUPS

Commodity Code	Commodity
1311	Crude petroleum
1493	Sulphur, liquid
2014	Tallow, animal fats and oil
2015	Animal by-products, NEC
2062	Molasses
2091	Vegetable oils, all grades; margarine and shortening
2092	Animal oils and fats, NEC
2810	Sodium hydroxide (caustic soda) - domestic only
2811	Crude products from coal tar, petroleum, and natural gas, except benzene and toluene
2813	Alcohols
2817	Benzene and toluene, crude and commercially pure
2818	Sulphuric acid
2819	Basic chemicals and basic chemical products, NEC - domestic only
2861	Gum and wood chemicals
2871	Nitrogenous chemical fertilizers, except mixtures
2873	Phosphatic chemical fertilizers, except mixtures
2876	Insecticides, fungicides, pesticides, and disinfectants
2911	Gasoline, including natural gasoline
2912	Jet fuel
2913	Kerosene
2914	Distillate fuel oil
2915	Residual fuel oil
2916	Lubricating oils and greases
2917	Naptha, mineral spirits, solvents, NEC
2918	Asphalt, tar and pitches
2991	Petroleum and coal products, NEC
9999	DOD controlled cargo and special category items

Source: Waterborne Commerce of the United States, U.S. Army Corps of Engineers.

APPENDIX B

BACKGROUND ON CONTAINER CARGO STATISTICS

APPENDIX B
BACKGROUND ON CONTAINER CARGO STATISTICS

This appendix provides background on the two types of data used to describe and analyze container trade in Chapter II:

- Containerized cargo tonnages used to identify recent and 1978 base year containerized cargo trade, and
- Containerizable cargo statistics used to analyze long term growth patterns in developing the forecasts.

The sections which follow describe the data sources and the analyses done to develop each data base.

CONTAINERIZED CARGO DATA

The foreign containerized cargo tonnages used in Chapter II to identify recent container traffic were compiled from the Maritime Administration (MarAd) data tapes of the Supplemental Unitized Cargo Container Reports (form MA578A). The reports are filed by each vessel carrying 25 or more TEUs (twenty-foot equivalent units) of cargo in containers or trailers.* MarAd summarizes and publishes the data annually as Containerized Cargo Statistics.

To test the accuracy of the MarAd statistics, TBS compared the MA578A data with three other sources:

- National Trade/Vessel Analysis reports, compiled by TBS for the Maritime Administration from daily vessel call data, showing import and export tonnage carried by breakbulk, partial and full containerships;

*Only minor amounts of container cargo could be omitted because of this reporting criterion.

- Census 305/705 reports and FT985 reports of U.S. - foreign liner tonnage by trade route and direction; and
- Pacific Maritime Association (PMA) revenue tonnage reports for container and general cargo at the individual Pacific Coast ports.

Based on this review, adjustments to the MA578A data were made to insure consistency among all sources. In combination, the comparisons and the adjustments insure that the containerized cargo tonnages compiled for the Pacific Coast and Bay Area accurately reflect historical and 1978 base year levels of container trade.

This appendix summarizes the review and comparison of the MA578A containerized cargo data with the information from other sources. The purpose is to explain the basis for the adjustments made and to provide confidence in the accuracy of the data based on consistency among sources.

National Trade/Vessel Analysis Reports

The National Trade/Vessel Analysis Reports (NT/VAR) were compiled by TBS for MarAd to provide a comprehensive series of profiles of vessel and cargo activity at each U.S. port for the years 1973 through 1977. The first check TBS made on the MA578A data was to compare the containerized cargo reported with the NT/VAR cargo carried on full containerships serving the Bay Area container facilities (Oakland and San Francisco). As Table B-1 shows, there is a fairly consistent ratio of containership carriage to MA578A tonnage for imports for 1973 through 1977. On the export side, however, the ratio falls considerably in 1977. A reduction in the MA578A container export tonnages of 400,000 tons brings the ratio closer to previous levels.

Table B-1

SAN FRANCISCO BAY AREA

COMPARISON OF MA578A CONTAINER TONNAGE
AND NT/VAR TONNAGE ON CONTAINERSHIPS

(thousands of short tons)

Year	NT/VAR Containership Tons Carried [B]	MA578A Container Tons	Ratio of Containership to MA578A
----------Imports----------			
1973	436	556	78%
1974	559	773	72
1975	460	711	65
1976	664	942	70
1977	916	1,261	73
----------Exports----------			
1973	796	1,297 [A]	61%
1974	909	1,492	61
1975	894	1,394	64
1976	1,251	1,657	75
1977	1,331	2,253	59
1977 (adjusted -400)		1,853	72

[A] Excludes an estimated 300,000 tons of military cargo for comparison with NT/VAR.

[B] Excludes containers on general cargo freighters and partial containerships and tonnage not included in the source data for NT/VAR.

Source: National Trade/Vessel Analysis Reports and MarAd MA578A reports.

Census 305/705 Liner Cargo

The Census 305/705 reports detail cargo imports and exports by U.S. and foreign port. The liner trade statistics encompass the regularly scheduled common carrier services that typically carry the majority of containerized cargo. As shown in Table B-2, the ratio of 1978 MA578A container tonnage to liner imports falls considerably from earlier years. Addition of 300,000 tons to the MA578A tonnage brings the ratio into alignment with previous levels. On the export side, the 1977 MA578A tonnage produces a very high ratio. When reduced by 400,000 tons, the value is more in line with other years. The adjustments also bring the pattern of growth in the MA578A data in line with the growth in liner tonnage. Before adjustment, the MA578A import tons were declining while the liner market was steady and exports were climbing when liner was not. Seattle imports also show a sudden shift in 1978 MA578A tonnage that is not in line with the more moderate growth of liner tonnage.

Pacific Maritime Association Revenue Tons

The Pacific Maritime Association (PMA) compiles revenue tonnage statistics for all cargo handled by union longshoremen on the Pacific Coast both foreign and domestic. Revenue tons are a mixed measure of weight and volume depending on the tariff used for the particular cargo carried. In Table B-3, the PMA revenue tonnage for containerized cargo through San Francisco and Oakland is compared with Bay Area domestic container and the MA578A foreign container tons. The foreign portion of the PMA revenue tons was derived by subtracting domestic container from the total using an estimated ratio of 1.1 revenue tons per short ton (which means that domestic cargos are comprised primarily of commodities with tariffs

Table B-2

SAN FRANCISCO BAY AREA

COMPARISON OF MA578A CONTAINER TONNAGE
AND CENSUS 305/705 LINER TRADE

(thousands of short tons)

	Liner Tonnage	MA578A Tons	Ratio of [B] MA578A to Liner
Imports			
1976	1,063	942	89%
1977	1,316	1,261	96
1978	1,413	925	65
1978 (adjusted +300)		1,225	87
Exports			
1976	2,005	1,657 [A]	83%
1977	2,140	2,253	105
1977 (adjusted -400)		1,853	87
1978	2,573	2,357	92
Seattle Imports			
1977	1,190	1,212	102%
1978	1,345	1,938	144
1978 (adjusted -300)		1,638	122

[A] Excludes an estimated 300,000 tons of military cargo for comparison with 305/705.

[B] Container tonnage may exceed liner tonnage since containers are also carried in non-liner service.

Source: Census 305/705 reports and MarAd MA578A reports.

Table B-3

SAN FRANCISCO BAY AREA

COMPARISON OF MA578A CONTAINER TONNAGE WITH
PACIFIC MARITIME ASSOCIATION REVENUE TONNAGE

Year	MA578A Imports & Exports (Includes Military) (Short Tons)	PMA Revenue Tons (Foreign and Domestic) (Revenue Tons)	Bay Area Domestic Container (Short Tons)	PMA Foreign (Adjusted for Domestic 1.1 RT = 1 ST)[A] (Revenue Tons)	Ratio of PMA Foreign to MA578A Container	PMA/Container Adjusted
1973	2,154	5,756	2,304	3,222	1.50	1.50
1974	2,565	6,388	2,055	4,128	1.61	1.61
1975	2,405	5,800	1,595	4,046	1.68	1.68
1976	2,898	6,820	1,545	5,121	1.77	1.77
1977	3,814	7,781	1,352	6,294	1.65	1.84
1978	3,583	8,846	1,126	7,607	2.12	1.96

[A]See Appendix C for RT/ST ratio.

Source: MarAd MA578A reports and History of Pacific Coast Tonnage, Tonnage by Port, Pacific Maritime Association, June 30, 1980.

based on weight, not volume).* The derived ratio of foreign PMA tonnage to MA578A tonnage shows an increasing trend until 1977 when it falls sharply and 1978 when it increases sharply. Adjustment of the MA578A tonnage by reducing 1977 by 400,000 tons and increasing 1978 by 300,000 tons brings the ratios into line with the trend of earlier years.

Adjustments

The NT/VAR comparisons indicated a probable requirement for a 400,000 ton decrease in 1977 MA578A exports. The Census 305/705 comparisons suggested a 400,000 ton decrease in 1977 exports and a 300,000 ton increase in 1978 imports. The PMA revenue ton comparison supports both a 400,000 ton reduction in 1977 and a 300,000 ton increase in 1978. TBS adopted a 300,000 ton increase to the 1978 imports and a decrease of 400,000 tons to the 1977 exports. The resultant consistency among sources provides confidence in the accuracy of the containerized cargo data.

CONTAINERIZABLE CARGO STATISTICS

Containerizable, as distinct from containerized, cargo is defined to include all commodities which, by current standards, are physically and economically suitable for containerization. The containerizable data base was developed for use in two analyses of the growth of containerizable cargo over the past 20 years. These analyses were used in developing the containerized cargo forecasts in Chapter II since they distinguish the long term growth of trade independent of the historic shift of breakbulk to container.

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*See Appendix C for discussion of the relationship between revenue tons and short tons.

The containerizable cargo statistics were developed from a series of analyses done for hearings before the Maritime Subsidy Board (MSB).* The time series date back to 1959 and have been compiled from data at the Census 3- and 4-digit commodity level to include the share of each cargo that would typically move by container.

The containerizable statistics are derived from MarAd 001 and 002 reports (previously MarAd 42A and 44A reports) which are MarAd compilations of original Census foreign trade data, the same Census data base used for the Army Corps foreign trade cargo statistics. The MarAd compilations are used since they provide commodity level data on a trade route and country/coast basis for liner and irregular trades. The Army Corps' data do not provide this level of detail.

The containerizable cargo statistics were compiled for the liner trades which encompass the regularly scheduled common carrier services that carry the great majority of containerized cargo. Similar statistics for non-liner containerizable cargo could have been compiled, but previous analyses have shown that the non-liner tonnages are not sufficient enough to affect the pattern of growth shown by the liner trades. Today, almost all liner cargo is containerizable and almost all containerizable liner cargo is containerized (90 - 95 percent). In the past, this was not the case both because of shifts in non-containerizable cargo from liner to irregular service (e.g. iron and steel products, grains, etc.) and shifts of containerizable cargo from breakbulk to containers. The analyses done to develop the 20-year data base of containerizable cargo statistics accounted for these shifts over time.

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*Analyses done by TBS and others are reported in MSB Dockets S-619 and S-417.

APPENDIX C

REVENUE TON/SHORT TON RELATIONSHIPS FOR CONTAINER CARGO

APPENDIX C
REVENUE TON/SHORT TON RELATIONSHIPS FOR CONTAINER CARGO

This appendix presents the results of the TBS analysis of the historical relationships between container revenue tons compiled by the Pacific Maritime Association (PMA) and the short ton statistics used in the Bay Area container cargo forecast. The purpose of the analysis is to explain the historical relationship, identify the likely future relationship, and discuss the effect of this analysis on the container forecasts and on the use of the forecasts in considering the future demand for container terminal facilities.

DEFINITION OF TERMS

As background, it is important to understand that for every given shipment of cargo there are several measures used to quantify it. Weight measures include short tons (2,000 lbs.), long tons (2,240 lbs.), and metric tons (2,204.6 lbs.). Volume or spacial character is described by measurement tons in terms of either cubic feet or cubic meters. Each shipment of cargo also has a corresponding number of revenue tons. The number of revenue tons is equal to either the number of weight tons or the number of measurement tons, depending on the tariff schedule for the individual commodities moved as set by liner operators, port authorities, and industry groups. The tariff schedules for individual commodities may change over time and can differ among operators, ports, or industry groups. As a generalization, cargos are most often rated as revenue tons based on whichever is the larger, the number of weight tons or the number of measurement tons.

In this appendix, the volume or spatial character of cargo as described by measurement tons is often referred to as the "cubic" of the cargo. Growth in cubic means growth in measurement tons of spatial volume. This is relevant when considering container trade since the growth in cubic signals an increase in the amount of space or number of containers needed to handle the trade.

The terms cubic cargo or cubic trades are also used to mean cargos with significantly greater than one measurement ton of volume per weight ton (e.g. 2 - 4 to 1). From the perspective of density, the more cubic trades are also the less dense trades. The concept of "increasing cubic" is used instead of "decreasing density" because it is easier to relate to the increasing usage of container terminal facilities.

HISTORICAL RELATIONSHIP

Comparison of Growth Rates

Table C-1 presents recent container tonnages for the Bay Area in terms of the short tons of imports, exports, and domestic moves. The growth in trade for each of these components varies substantially and can be compared with the overall growth of trade in short tons and in revenue tons. The growth in total revenue tonnage approaches 8 percent between 1973 and 1977 while the total short ton growth is only 1.68 percent. There are several factors contributing to this difference in growth rates as explained below.

Mix of Import, Export, and Domestic Trade

Some of the difference between the aggregate revenue tonnage and short tonnage growth rates is due to a combination of the

Table C-1

COMPARISON OF HISTORICAL SAN FRANCISCO BAY
SHORT TON AND REVENUE TON CONTAINER VOLUMES

(thousands)

	Imports (Short Tons)	Exports (Short Tons)	Total Foreign (Short Tons)	Domestic (Short Tons)	Total Short Tons	Total Revenue Tons[E]
1973	556	1,597	2,154	2,304	4,458	5,756
1974	773	1,792	2,565	2,055	4,620	6,388
1975	711	1,694	2,405	1,595	3,997	5,800
1976	942	1,957	2,898	1,545	4,443	6,821
1977	1,261	2,153[A]	3,414	1,352	4,766	7,781
1973-1977 % Annual Growth	22.17%	7.75%	12.20%	(12.48%)	1.68%	7.83%
1978	1,225[B]	2,658	3,883[B]	1,126	5,009	8,846
1979	1,369[C]	2,985[C]	4,354	1,126[D]	5,480	9,410
1980	1,398[C]	3,000[C]	4,398	1,126[D]	5,524	9,658
1973-1980 % Annual Growth	14.08%	9.43%	10.74%	(9.72%)	3.11%	7.67%

[A] Net of 400,000 ton adjustment identified in Appendix B

[B] Includes 300,000 ton adjustment identified in Appendix B

[C] 1979 and 1980 estimated as follows:

--Container imports represent 96 percent of liner imports for annual 1979 and 1980 annualized from January-September data.

--Container exports represent 92 percent of liner exports for annual 1979 and 1980 annualized from January-September data.

[D] Estimated at 1978 level.

[E] Pacific Maritime Association.

Source: Table II-1 and Pacific Maritime Association.

different growth rates and the differing ratios of revenue tons to short tons for each segment of the trade: imports, exports, and domestic moves. Table C-2 illustrates these effects by comparing historical revenue tonnage figures with computed revenue tons for each segment. The revenue tonnages were derived from representative detailed shipping records since PMA revenue tonnages were not reported by direction.

The foreign trade revenue ton to short ton ratios were identified by the Army Corps and the domestic trade ratio from data from the Port of Oakland. As shown in Attachment 1, the Corps study identified 2.4 and 1.85 as the ratios of revenue tons to long tons for foreign imports and exports, respectively. These ratios become 2.16 and 1.65 when converted to short tons. The ratio for domestic trade, based on Port of Oakland data, shown in Attachment 2, is about 1.1 revenue tons per short ton.

Table C-2 compares historical revenue tonnage values with computed revenue tonnage figures based on the revenue ton to short ton ratios discussed above and assuming no change in these ratios over time. The computed revenue tons show growth over the 1973-1977 period of 5.1 percent, which indicates that much of the difference in growth rates observed in Table C-1 can be traced to the differing revenue ton/short ton ratios for imports, exports and domestic container trade and the individual patterns of growth or decline for each segment. Since the overall growth of the computed revenue tons is 5.1 percent while actual revenue tons were at 7.8 percent, some portion of the difference between the two is explained by other factors.

Cubic Nature of Cargo

Table C-3 presents statistics on Bay Area foreign container trade, measured in short tons and measurement tons. Comparisons indicate a modest increase in the measurement ton to short ton

Table C-2

COMPARISON OF ACTUAL AND COMPUTED SAN FRANCISCO BAY
REVENUE TONS ASSUMING CONSTANT RT/ST RATIOS

(thousands)

	Imports [A] (Revenue Tons)	Exports [B] (Revenue Tons)	Total Foreign (Revenue Tons)	Domestic [C] (Revenue Tons)	Total Computed Revenue Tons	Total Actual Revenue Tons [D]
1973	1,201	2,635	3,836	2,534	6,370	5,756
1974	1,670	2,957	4,627	2,260	6,587	6,388
1975	1,536	2,795	4,331	1,755	6,086	5,800
1976	2,035	3,229	5,264	1,699	6,963	6,821
1977	2,724	3,552	6,276	1,487	7,760	7,781
1973-1977 % Annual Growth	22.17%	7.75%	13.10%	(12.48%)	5.10%	7.83%
1978	2,646	4,386	7,032	1,239	8,271	8,846
1979	2,957	4,925	7,882	1,239	9,121	9,410
1980	3,020	4,950	7,970	1,239	9,209	9,658
1973-1980 % Annual Growth	14.08%	9.43%	11.01%	(9.72%)	5.41%	7.67%

[A] 2.16 RT/ST based on Army Corps research.

[B] 1.65 RT/ST based on Army Corps research.

[C] 1.1 RT/ST based on Recht Hausrath analysis of Port of Oakland domestic data.

[D] Pacific Maritime Association.

Source: Table C-1.

ratios over the 1973 to 1977 period.* This indicates that the volume or spatial character of container cargo has been increasing relative to the weight or that the cargo has become more cubic over time. This has been due to changing commodity mixes and packaging forms. One result is that more containers must be handled to carry the same weight of cargo and more terminal capacity must be used. Another result is that the revenue ton to short ton ratios have been increasing independent of the changing balance of import, export, and domestic trade.

Over the 1973-1977 period, Table C-3 shows that foreign imports became more cubic at about .6 percent per year while exports have changed at .3 percent per year. The weighted average rate of change based on 1977 tonnages is 0.4 percent per year. This trend will potentially continue leading to future increases in the aggregate revenue ton to short ton ratio independent of the changing balance of import, export and domestic trade.

Cargo Rating

The increases in the revenue ton to short ton ratios due to mix of cargo by trade segment and in the measurement ton to short ton ratios due to increasingly cubic cargo discussed above do not account for the total differential in revenue ton and short ton growth rates. Other factors involve the rating or tariff schedules for determining revenue tons. However, since

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*These ratios compare well with the revenue ton to short ton ratios developed by the Corps (see Attachment 1). The measurement ton to short ton ratios are the maximum possible ratios for revenue tons to short tons and would occur if all cargos were rated for tariff purposes on a measurement ton basis. In 1977, for example, the Table C-3 measurement ton to short ton ratios are 2.48 and 1.74, which are about 10 percent above the Corps revenue ton to short ton ratios of 2.16 and 1.65. This is consistent with the fact that some cubic cargos (those with greater than 1 measurement ton of volume per weight ton) are rated on a weight basis and not on volume.

Table C-3

SAN FRANCISCO/OAKLAND

FULL CONTAINERSHIP SHORT TON AND MEASUREMENT TONS

1973-1977

Year	Short Tons	Measurement Tons	Measurement Tons/ Short Tons
		Imports	
1973	435,744	1,056,401	2.42
1974	558,182	1,306,826	2.34
1975	460,907	1,133,471	2.46
1976	664,461	1,705,632	2.57
1977	915,863	2,275,160	2.48
		Exports	
1973	863,300	1,489,178	1.72
1974	909,713	1,596,086	1.75
1975	893,688	1,510,206	1.69
1976	1,250,692	2,150,481	1.72
1977	1,330,430	2,310,822	1.74
		Total	
1973	1,299,044	2,545,579	1.96
1974	1,467,895	2,902,912	1.98
1975	1,354,595	2,643,677	1.95
1976	1,915,153	3,856,113	2.01
1977	2,246,293	4,585,982	2.04

Source: National Trade Vessel Analysis Reports, TBS.

Measurement tons were computed using stowage factors developed by George Sharp, Inc. for the Maritime Administration.

revenue ton statistics are not readily available for disaggregated segments of the trade, it is difficult to separately identify these other factors.

Changes in the rating of cargos such as from a weight ton basis to a measurement basis would change the revenue ton to short ton ratios over time. Continued changes in rating would not necessarily result in greater demand for terminal capacity, however, since the cubic of the cargo would remain unchanged if the measurement ton to short ton ratios are not affected.

Secondly, differences in the relative growth of commodities with different tariff schedules could also contribute to the remaining differential in the growth rates of revenue tons and short tons. This factor differs from the effect of mix discussed earlier in this appendix since it concerns the mix of commodities within the import, export, or domestic sectors. It also differs from the effect of increasing cubic since changes in the ratios of revenue tons to short tons resulting from rating differences do not affect the ratios of measurement tons to short tons nor the demand for terminal capacity.

Thus, the remaining portion of the differential in growth rates for revenue tons and short tons may be associated with changes in the ratio of revenue tons to short tons which are not associated with significant increases in the cubic of the cargo or the demand for terminal capacity.

Regarding the basis for cargo ratings, another point should be noted that is relevant to the earlier discussion of the mix of foreign and domestic trade in Table C-2 and the associated text. While the low revenue ton to short ton ratios in the domestic trades relative to the ratios for foreign trades are a reflection of less cubic (more dense) cargos, they also reflect the greater use of weight tons as a basis for revenue ton calculations in domestic trades. Therefore, the aggregate increases

in revenue tons per short ton resulting from relative declines in the domestic trades do not necessarily reflect an increase in the average cubic per ton except to the degree that the domestic cargos which declined are actually less cubic (more dense) than the foreign cargos that increased. Since the available data do not allow for an estimation of the significance of this effect, it is assumed that all of the differential in the growth rate of revenue tons as a result of the mix of domestic and foreign trade represents increases in cargo cubic that increase the need for terminal capacity.

Summary

The sections above identified several factors responsible for the observed differences in growth rates between the PMA revenue tonnage and the short tonnage statistics. Although the available data do not allow for detailed analysis of all of the factors, the higher rate of growth of PMA container revenue tons is compatible with the more moderate growth of weight tons. The two types of statistics merely provide different measures of the same movements of container cargo.

Examination of the various systems for measuring cargo movements indicated that a measure of the spatial aspect or volume of container cargo is more useful for terminal facility planning purposes than a measure of weight tons since it provides a better indication of the increase in containers handled. As explained, the cubic or spatial volume of container cargo has been increasing faster than the weight. The analysis indicates that the growth rate of revenue tons is higher than the rate for weight tons partly because the revenue ton statistics include the effect of increases in cargo cubic. However, as explained, the difference in growth rates also includes other factors which do not relate to cargo cubic or terminal usage.

REVENUE TON AND SHORT TON FORECASTS

In order to illustrate the potential future effects of the revenue ton/short ton relationship on terminal facilities Table C-4 computes domestic and foreign revenue ton forecasts that incorporate revenue ton/short ton ratios of 1.96 for foreign* and 1.1 for domestic and allow a continuing growth in these ratios of .4 percent per year through 1985, .3 percent through 1990, .2 percent through 2000, and .1 percent through 2020. The resultant revenue ton forecasts account for changes in the aggregate relationship between revenue tons and short tons that results from the changing mix of import, export, and domestic trade and for increases in the cubic nature of the cargo independent of the changing mix of the trade.

Table C-5 provides a comparison of the short ton and revenue ton container forecasts. The higher growth rates for the revenue ton forecast reflect both higher rates of growth in the more cubic trades (those with greater volume per short ton and higher revenue ton to short ton ratios) and the continued increase in the cubic or spatial character of the cargo moved per short ton. These factors are significant because the demand for container terminal capacity will tend to increase more nearly in line with the growth of the cubic of the cargo than with the growth of weight tons. The difference in growth rates indicates that the use of container terminal capacity will continue to increase faster than the increase in short tons of cargo.

In order to quantify an estimated potential impact on the demand for facilities of the revenue ton growth shown in

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*See Table B-3.

Table C-4

COMPUTATION OF CONTAINER REVENUE TON FORECAST

I. Foreign

A. Short Tons

SAN FRANCISCO BAY AREA
CONTAINERIZED CARGO - IMPORTS AND EXPORTS
(thousands of short tons)

	Adjusted* 1978	Forecast 1985	1990	2000	2020
High	3,883	7,575	12,115	21,455	56,660
Baseline	3,883	7,010	10,720	18,085	47,065
Low	3,883	6,225	8,750	14,020	35,910

*see Table II-1.

B. Revenue Tons

RT/ST Ratio Compound Growth Rates:		.4	.3	.2	.1
RT/ST Ratio:	1.96	2.02	2.05	2.09	2.13
High	7,611	15,301	24,836	44,841	120,686
Baseline	7,611	14,160	21,976	37,798	100,248
Low	7,611	12,575	17,938	29,302	76,488

II. Domestic

A. Short Tons

SAN FRANCISCO BAY AREA
CONTAINERIZED CARGO
DOMESTIC SHIPMENTS AND RECEIPTS
(thousands of short tons)

	Actual 1978	Forecast 1985	1990	2000	2020
High	1,126	1,385	1,605	2,055	3,370
Baseline	1,126	1,250	1,345	1,525	1,955
Low	1,126	1,126	1,126	1,126	1,126

B. Revenue Tons

RT/ST Ratio Compound Growth Rates:		.4	.3	.2	.1
RT/ST Ratio:	1.1	1.13	1.15	1.17	1.20
High	1,239	1,565	1,846	2,404	4,044
Baseline	1,239	1,413	1,547	1,784	2,346
Low	1,239	1,272	1,295	1,317	1,351

TABLE C-5

COMPARISON OF SHORT TON AND REVENUE TON
FORECASTS OF CONTAINERIZED CARGO

CONTAINER SHORT TON FORECAST
FOREIGN AND DOMESTIC CARGO
(thousands of short tons)

	1978	% Growth	1985	% Growth	1990	% Growth	2000	% Growth	2020
Baseline	5,009	7.4%	8,260	7.9%	12,065	4.9%	19,610	4.7%	49,020
High	5,009	8.7	8,960	8.9	13,720	5.5	23,510	4.8	60,030
Low	5,009	5.6	7,351	6.1	9,876	4.4	15,146	4.6	37,036

CONTAINER REVENUE TON ESTIMATE
FOREIGN AND DOMESTIC CARGO
(thousands of revenue tons)

	1978	% Growth	1985	% Growth	1990	% Growth	2000	% Growth	2020
Baseline	8,850	8.4%	15,573	8.6%	23,523	5.3%	39,582	4.9%	102,594
High	8,850	9.7	16,866	9.6	26,682	5.9	47,245	5.0	124,730
Low	8,850	6.6	13,847	6.8	19,233	4.8	30,619	4.8	77,839

Table C-5, the growth rates in revenue tons were assumed to be applicable to the base year short tons shown in the table and used to predict future levels of short tons which reflect future capacity requirements measured in current short tons. In general, the results are approximately 8 - 10 percent above the 1990 container short tons in Table C-5 and 17 - 19 percent above the 2020 short tons. For example, Table C-5 shows 1990 revenue tons to increase by 166 percent from the 1978 tonnage level. If the 1978 short tons of container cargo increased by the same proportion, the forecast for 1990 would rise to 13.3 million short tons, which is 10 percent above the 1990 forecast of 12.1 million short tons shown in the table. The significance of this is that the 1990 levels of terminal capacity will be required to be up to 10 percent greater in short ton capacity as measured today to accommodate the more cubic cargos of the future. By 2020 the required levels of capacity will need to be up to 17 - 19 percent above the short ton cargo forecast if the capacities are measured in current short tons.

Two points should be clarified regarding the use of the revenue ton forecast and growth rates. First, it should be noted that the revenue ton forecast incorporates only the factors that could be expected to affect the demand for terminal capacity. As noted, there may be other factors that affect the growth rates of revenue tons, such as changes in the tariff rating of cargos. To the extent that these other factors are involved, the actual future revenue ton statistics could differ from those shown in the forecasts. This is particularly relevent for future monitoring efforts. If, for example, the PMA revenue ton statistics show higher growth than the revenue ton forecasts, that situation would not necessarily indicate that either the short ton forecast is low or that the estimated

demand for terminal capacity based on the revenue ton growth rates is low. Instead, the difference may actually be due to other factors that affect the revenue ton figures independent of changes in the cargo cubic or weight.

The historical relationship section of this appendix provides an example of this point. It indicates that the difference in revenue ton/short ton growth rates due to increases in the cubic volume of the cargo (because of changes in the mix of trades and in the revenue ton/short ton ratios for them) was less than the actual difference observed from the statistics. The additional differential appears to be associated with the rating of cargos which did not affect the cubic nature of the cargo nor the demand for capacity.

Second, although the estimated revenue ton growth rates are the best that could be developed from available data and reflect the factors that could be expected to affect the demand for terminal capacity, they could be high end estimates of the actual future rate of increase in the cubic of future containerized cargo. This is because some of the change in the ratio of revenue tons to short tons incorporated in the revenue ton forecast may be due to rating changes related to commodity mix and tariff schedules and not to an increase in the spatial volume per short ton of the cargo moved. The historical relationship section of this appendix provides further discussion of this point.

Attachment 1

REVENUE TON/LONG TON CONVERSION FACTORS
FOR FOREIGN TRADE

Trade Route	Imports Revenue Ton/ Long Ton	Exports Revenue Ton/ Long Ton
Africa	.8	2.26
Australia-Oceania	1.07	2.04
Central America	.76	2.08
European	1.22	1.33
Persian Gulf	.64	.25
East Asia	3.01	1.86
South America	1.04	---
West Indies	---	5.00
All Foreign Routes	2.4216	1.8523

BASED ON: Port of Oakland revenue ton data for 1978, MarAd and Port of Oakland foreign weight ton data for 1978.

SOURCE: Exhibit 5, Derivation of Factors for Conversion of Revenue Tons to Weight Tons for the San Francisco Bay In-Depth Investigation, Army Corps of Engineers, San Francisco District, 1980.

Attachment 2

REVENUE TON/SHORT TON CONVERSION FACTORS
FOR DOMESTIC TRADE

Revenue Ton/Short Ton Ratios:

- Inbound Hawaiian trade generally 1.00:1.
- Outbound Hawaiian trade, generally about 1.15:1.
- Outbound represents 69.1 percent of Hawaiian (85 percent of total) and total domestic trade, which results in a weighted average of 1.1 revenue tons per short ton. This ratio has been assumed for all domestic trade.

BASED ON: Recht Hausrath & Associates' analysis of Port of Oakland data for 1978 and selected statistics for 1980.

NOTE: Army Corps' ratios for domestic trade were not used in this analysis since less than half of the reported domestic revenue tons used represented container cargo (55 percent of 1978 domestic revenue tons were steel products, dry bulk, and liquid bulk tonnages).

SOURCE: Recht Hausrath & Associates and Temple, Barker & Sloane, Inc.

STUDY PARTICIPANTS

TECHNICAL ADVISORY COMMITTEE (TAC)

DENNIS THUET	Army Corps of Engineers, Contractor's Project Manager
FRANK BOERGER	Northern California Ports and Terminals Bureau
DENNIS FAY	Metropolitan Transportation Commission
PHIL KERN	Bay Conservation and Development Commission
JACK KNECHT	U.S. Maritime Administration

Others Who Participated in TAC Review of Forecast Work:

GARY HERSHDORFER	Corps Economics Division
J. PRESLEY LANCASTER	Pacific Maritime Association
MARCELLA JACOBSON and BOB BLUMENTHAL	Save San Francisco Bay Association
GERALD POPE and DR. SHANTI VORA	NORCAL and Port of Oakland
PETER HUGHES	Port of Richmond

CONSULTANT PROJECT TEAM

RECHT HAUSRATH & ASSOCIATES

Linda L. Hausrath
Principal, Economist
Project Manager

Paul Rosenstiel
Economist

Cynthia Reeves
Research Associate

TEMPLE, BARKER & SLOANE, INC.

Michael S. Sclar
Vice President
Director of Maritime Group
Project Technical Director

Lawrence Smith
Consultant

James Brennan
Associate

James O'Connell
Senior Associate

INDUSTRY REPRESENTATIVES INTERVIEWED

BILL STEWART	Vice President-Distribution, C & H Sugar, Crockett
JIM WALTON	Leslie Salt, Redwood City Operations
T. R. EIZENBER	Exxon Company, Benicia
LOWELL NORRIS	Exxon Marketing, Houston
GEORGE GISSENDANER	Senior Traffic & Transportation Engineer, U.S. Steel, Pittsburg
BOB HOWARD	Manager of Commercial Research, Kaiser Steel, Oakland
GENE TABOR	General Manager, Judson Steel, Emeryville
LOYLD McQUILLIAM	Manager, Con Agra, Inc., Oakland
VELLO KIISK	Chief Engineer Port of San Francisco
FRED DI PIETRO	Manager, Port of Redwood City
ADAM VINCENT	Benicia Port Terminal Company
PETER WANG	President, Encinal Terminals
DR. SHANTI VORA	Director of Research, Port of Oakland


TIC